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The Report of the D.S.I.R.

INDUSTRY has come to look forward to the report of the Department of Scientific and Industrial Research as providing a useful account of the general progress of applied chemical and physical research. This year is no exception to the general rule. At first sight the position appears to be very satisfactory indeed. This view is based upon a chart given in the report showing the growth in financial resources of research associations since 1920. In that year there were 17 associations operating for industries which between them contributed some £97,000 for the purpose, to which was added a further £65,000 from D.S.I.R. grants. During succeeding years, from 1921 to 1926 inclusive, the amounts subscribed by industry varied between £110,000 and £120,000, whilst grants attained a peak in 1923 of £105,000, which has only once been exceeded, namely, in the year now under review. After 1926 industry appears to have become more definitely research-minded, and there was a rapid upward growth of the income subscribed. The £120,000 mark was exceeded in 1928 for the first time; 1929 saw the £150,000 mark exceeded, and of late years the income subscribed by industry has jumped from £190,000 in 1934 to £232,000 in 1935, in each of which years there were 19 research associations. Grants have varied around an average figure of £70,000, reaching £68,000 in 1934, and £110,000 in 1935.

The Advisory Council does not, however, consider that the position of research associations as a whole is yet satisfactory, and suggests that industry should do still more organised research now. There is perhaps a difference of opinion here between the Council and industry. The Council has offered grants amounting to £81,000 a year during the coming year if industry will increase the income subscribed by a sufficient amount to warrant this extension. The amount actually subscribed, however, falls so much below the amount that the Council believes to be desirable, that the total of the additional grants made amounts only to £15,000, so that, in the words of the report, "The Department is prepared to find another £66,000 each year, and would have been prepared to find that sum in each of the past two years, had industry been ready to provide equivalent contributions." The Council points to the increased expenditure on research by industry, and to the erection of large buildings and extensions of equipment for research purposes as evidence that the outlook is encouraging, but we cannot help feeling that the Council is far from satisfied that as much is being done by industry in the organisation of co-operative research as is desirable.

It is well to look through the report to discover why the Council lays such stress upon organised research. The first reason seems to be that it is regarded as one of the most important tasks of the D.S.I.R. to conduct research in such a way as to promote contact with industry. Research in industry is a means to an end—nothing more; it is industrially valueless unless the scientific knowledge so gained is applied to all stages of production, and to the development of new products and processes.

The Council feels that organised research associations in which each industry has a substantial stake provide the best means whereby this close association is to be achieved. The second reason is the recognition of the fact that the day of individualistic research has passed, and the day of combined organised team work has arrived. It used to be remarked before the war that Continental nations preferred to do research by means of large teams, whereas the British preferred individual brilliance.

The D.S.I.R. is evidently convinced that organised team work is the only possible basis of research. We, however, are a good deal less sure upon that point. In spite of increasing specialisation we are still of the opinion that the brilliant individual can do a very great deal. This is not to say that we condemn the team work complex of the D.S.I.R. There are undoubtedly many industrial problems which arise quickly and must be solved rapidly if their successful solution is to have any value, but we question whether *fundamental* advances result from team work so much as from the restrained imaginative brilliance of a well-trained individual brain. A vast number of experimental results can be obtained quickly by a team of skilled manipulators, but it generally needs one clear intellect to see beyond those results to a great discovery. How far, for example, has our knowledge of the constitution of the atom come from team work, and how far from the brilliance of a few individuals? The report recognises that this country has never been lacking in men of genius whose inventive capacity can give birth to the ideas which bring about industrial advances. What is new (it states) in this country, in present times, is the way in which industry has taken up these new ideas and brought them to the stage of industrial application by team work in which the scientists, the technical men and all the departments into which a great business is organised have worked side by side in the practical attainment of an objective.

Unquestionably, when the individual has done his work in the laboratory, the whole industrial team must come into play to give a discovery its practical significance.

Notes and Comments

Leverhulme Research Fellowships

NEXT Monday, March 1, is the last day for receiving applications for Leverhulme Research Fellowships and grants in aid of research for 1937. The Fellowships are intended primarily to provide for senior workers a period of freedom from routine duties during which they may undertake or complete researches which are being delayed through the pressure of other work. The grants are intended to provide for senior workers, who may not require release from their ordinary duties, such assistance as may be necessary to enable them to expedite or complete their work. Neither Fellowships nor grants are awarded to graduates doing research with the object of obtaining higher degrees. Applicants must be British-born and normally resident in the United Kingdom. In exceptional circumstances the trustees may waive the conditions as to residence. The duration of the grants will not normally extend over less than three months or more than two years, and the amount will depend on the nature of the research and the circumstances of the applicant. Any subject which may add to human knowledge may be proposed for a Fellowship, but preference is given to subjects in which other provision for research is inadequate. The first Leverhulme Fellowships were awarded by the trustees in 1933 and the total number of Fellowships and grants in aid of research for 1933-1936 is 94. The secretary is Dr. L. Haden Guest, Leverhulme Research Fellowships, Union House, St. Martin's-le-Grand, London, E.C.1. Awards will be announced in July, and the Fellowships or grants will date from September 1.

Simple Safety Rules

THE "ten commandments" for chemical workers reprinted in another page from the transactions of the Chemical Section of the United States National Safety Congress summarise the principal safety items with which every industrial and chemical worker should be familiar. They were submitted to the congress by Mr. John S. Shaw, who, as the result of wide experience as manager of the safety and service department of the Hercules Powder Co., Wilmington, Delaware, urged that when selecting chemical workers employers should choose men not only of good health but of good common sense. If possible they should have at least the equivalent of a high school training so that they will understand their instructions and the reason for them. The chemical worker should appreciate that we must breathe a certain mixture of nitrogen and oxygen in the form of pure air. That is what our organs are equipped for, and when we introduce anything into the atmosphere to change its composition, we affect life's process more or less. It is true that the human body has an immense amount of adaptability and that immunity can be relied upon in some instances to a remarkable extent; however, we should stick to the simple fundamental that nature provided for us in a normal way and we should be normal in our living. The "rules of the game" given to chemical workers are very complete in anticipating all possible hazards, thereby giving them the maximum possible protection. Every chemical worker should observe these rules religiously.

Industry and the Budget

BUDGET day is approaching and the burden of taxation is being widely discussed in industrial circles. The Federation of British Industries has addressed a letter to the Chancellor of the Exchequer in which are set out industry's claims for consideration in the new Budget. It expresses the view that the present rate of income tax is very onerous, but recognises the fact that times are not normal. While expressing the hope that it may not be found necessary to increase the standard rate of income tax, the Federation urges that, if the present emergency cannot be met without increased direct taxation, such increase may be regarded as an emergency levy to be removed at the earliest possible date. Reference is made to the Report of the Committee on the Codification of Income Tax, and the hope expressed that a Codifying Bill, based on its recommendations, may be introduced as soon as possible. The Federation strongly supports the recommendation of the Codification Committee that wear and tear should be treated as a charge against profits instead of an allowance against the assessment in the following year, as is done at present. Support is also given to the committee's proposals with regard to wear and tear and obsolescence of standby machinery. With reference to the allowance granted as "depreciation" for factory buildings, the Federation urges that the amount of the allowance should be increased to compensate for the reduction in assessable value by reason of Section 22, Finance Act, 1936. The Federation refers to the Government's powers to effect agreements for the avoidance of double taxation on profits arising through agencies, and suggests that wider powers should now be taken to enable double taxation agreements to be concluded when possible.

The Factories Bill

IN no branch of industry are considerations of health, safety and welfare of greater importance than in the making of chemicals and the construction of chemical plant, and it is therefore appropriate that the new Factories Bill should have been selected as the topic for informal discussion at next week's annual dinner of the British Chemical Plant Manufacturers' Association, with Mr. D. R. Wilson, Chief Inspector of Factories, as the opening speaker. In a special article last week we drew attention to those points in the Bill that are of special concern to the chemical industry, pointing out that many special regulations of chemical trade interest will remain alive after the passing of the Act. What the new Bill declares in the form of statutory requirement is that factory conditions shall not be injurious or dangerous in so far as there are known precautions for the safeguarding of health and safety. The standards laid down are minimum standards to which all new factories must conform and to which old factories must be raised within a few years at most. As Sir Kingsley Wood, Minister of Health, said in the debate on the second reading last week, the Bill opens up a new chapter in factory conditions for many millions of workers. When it becomes law Great Britain will be able to claim that it leads the world in legislation for the safety, health and welfare of its industrial population.

Technical Aspects of Wetting and Detergency

A Symposium arranged by the I.S.L.T.C.

A SYMPOSIUM on the scientific and technical aspects of wetting and detergency was held at the Huxley Building, Imperial College of Science and Technology, Kensington, on Friday and Saturday, February 19 and 20. Dr. R. H. Marriott, president of the British Section of the International Society of Leather Trades' Chemists, welcomed the meeting and asked Professor F. G. Donnan to take the chair for the morning session. After lunch on Friday, the chair was occupied by Dr. W. Clayton, F.I.C.; on the Saturday morning, the meeting was presided over by Dr. R. H. Marriott, F.I.C. Some 250 persons attended the meetings.

On the Friday evening an informal dinner was held at the Chantecler Restaurant, Soho, and the guests of honour included Professors F. G. Donnan, H. Freundlich, A. Ferguson, H. S. Taylor (Princetown University, United States), and Dr. W. Clayton.

Wetting in Flotation

Flotation is a method for separating valuable minerals from gangue, based on a difference in wettability, said Dr. H. Freundlich. This difference is produced by adding suitable organic substances called collectors which reduce the wettability of the mineral without changing that of the gangue. The poorly wettable mineral particles are accumulated on the surface of the liquid, whereas the wettable particles of the gangue remain in the bulk of the liquid. In order to collect large amounts of the mineral on the surface, the latter is enlarged by producing a stable froth. This is done by adding special substances termed frothers. Some substances called frothing collectors unite the properties of increasing the difference in wettability of the mineral and gangue and of producing a stable foam.

The quantitative treatment of wetting has not been very successful. It is also doubtful whether the theory of wetting, so far mainly developed for a state of equilibrium, can be applied strictly to the process of flotation. The influence of kinetic phenomena (rate of wetting, influence of minute residual amounts of air on the solid surfaces, etc.) has been rather neglected and may be important. Nevertheless, experiments concerned with static differences in wettability (measurements of contact angles, etc.) agree fairly well with the results of technical flotation. The action of the collectors may be due to several causes (adsorption, chemical reactions, etc.). Practically all collectors are polar-nonpolar substances, *i.e.*, they have a hydrophobic group distinct from a hydrophylic one. This structure makes it probable that an orientated adsorption of the collector molecules on the mineral particles is an essential feature in their activity.

Some Problems on Wetting

Communication from Dr. Allan Ferguson, M.A., F.Inst.P., described methods for the measurement of surface tension and angles of contact—the quantities of fundamental importance in dealing with problems of wetting. The surface tension methods described demand the use of no more than a few cubic millimetres of the liquid under test, and no knowledge of its density is required. Assuming the surface tension to be known, contact angles may be determined by directly measuring the pull on a plate touching the liquid, or by immersing the plate until the surface tension pull is just balanced by the buoyancy.

According to Dr. S. H. Bell, Dr. J. O. Cutter and Mr. C. W. Price, who presented a paper on "Bartell Cell Technique," the liquid/solid contact angle and the adhesion tension in the system linseed oil/lithopone have been determined by measuring the pressure set up by the liquid upon entering the capillaries of a compressed plug of the solid. The adhesion tension so determined for a number of lithopone samples is of the order of 25-30 dynes/cms.

Fatty acid salts were the original type of wetting agent and their stability in hard water, solubility and wetting power can be changed by alterations in the chain length, introduction of double bonds, by the formation of amine salts and by sulphonation, said Dr. H. K. Dean, A.I.C., who discussed the importance of solubility and balance.

The inherent disability of the soaps, namely, precipitation by lime, can be largely overcome by blocking the carboxylic acid group by amidation, esterification or reduction to the alcohol. The introduction of a sulphonic acid group is a method applicable to compounds containing a double bond, aromatic ring or halogen atom; alcohols can be esterified with sulphuric or phosphoric acids, or organic acids containing solubilising groups—citric and sulphoacetic acids. Amino compounds include an important group of wetting agents. Straight chain and cyclo aliphatic amines are stable in hard water while many quaternary ammonium salts are effective in acid neutral or alkaline solutions. Cyclic amines, iminazoles, thioazoles or oxazoles form the basis of other agents. Mercaptans and phenols can replace the normal alcohols in many cases and sulphurated petroleum fractions are well known and contain no carboxyl group. Ethers, too, are employed and have the advantage of insensibility to alkali; the related acetals and the condensation products of aldehydes and amines have recently been utilised.

Measurement of Contact Angles

The technique of measurement of contact angles against water was described by Dr. C. G. Sumner, M.Sc., A.I.C., using apparatus of the "tilting plate" type. The essential features of the apparatus were (1) the water surface is cleaned by the overflow method; (2) the axis of rotation of the plate lies in the water surface, so as to minimise displacement of the line of contact during measurement; (3) provision is made for forming either the "advancing" or "receding" angle of contact; and (4) the contact angle is read directly on a scale. A special device is also incorporated for viewing the distortion of the water surface where the latter meets the solid. This depends on the observation of a line of light both directly and by reflection from the surface of the water. In the case of lacquered plates, the precision of measurement is found to depend on the surface being wetted, chiefly owing to an irregular line of contact being obtained in many instances.

Dr. N. K. Adam, F.R.S., and Mr. H. L. Shute described a method of measuring contact angles on thin wires or single textile fibres. The method is identical in principle with the ordinary "plate" method, the junction of the fibre and liquid surface being observed through a low power of the microscope. The accuracy obtainable is about equal to that of the "plate" method.

Wetting and Deflocculation

A permanent dispersion of a solid powder in a liquid medium is characteristic of the effect of a peptiser or deflocculator acting at the interface to inhibit mutual attraction of the solid particles. According to Mr. A. de Waele, F.I.C., F.Inst.P., the mechanism of peptisation is in the nature of chemo-sorption at the interface, whilst deflocculation is resultant on capillary adsorption. Investigation as to the nature and degree of the stabilisation in a solid/liquid dispersion may be followed by determination of the plastometric constants.

Waterproofness is a term which has been the subject of much confused thinking on the part of experimenters in past years, said Dr. R. S. Edwards, A.R.C.S., D.I.C., who suggested that waterproofness cannot be uniquely defined and that two main factors must be recognised, *i.e.* (a) the resistance of leather as a wall to the passage of water, (b) its absorbing capacity. The first essential is to devise adequate

means of test and a review is given of the developments in this direction. In accordance with the suggested definition of waterproofness they fall into two classes, water permeability and water absorption tests. The latter measurement is the easier and has been the more popular, but water permeability has proved more susceptible to theoretical examination.

It is concluded that all attempts to express the entry of water into leather, either from one face to another or during immersion, are based fundamentally upon the application of Poiseuille's law to very fine capillary tubes in the process of filling. It has been further shown that the holding capacity is dependent upon the free or air space in the leather and the residual swelling capacity of the fibres themselves. Water soluble matters affect the rate of entry via the surface tension and viscosity of the solution they form with the entering water. Waterproofness can be controlled in many ways, but it is suggested that the ideal place is the tannery rather than the shoe factory. If, however, it is desired to improve the finished product, the oils, fats and waxes may be used, and a suitable method of treatment is suggested. By this process, waxes are applied to the flesh side only of the leather, a procedure greatly facilitating shoe manufacturing operations.

Wetting of Metals by Metals

The wetting of solid metals by liquid metals of low melting point particularly by tins and solder was discussed by Mr. E. J. Daniels, M.Sc., and Mr. D. J. Macnaughtan, F.Inst.P., in the light of existing knowledge and compared with such phenomena as the wetting of liquids by liquids, of solids by oils, and electrodeposition. Wetting of metals by metals was considered for three important cases :—(1) Coatings produced by immersing the solid in a bath of molten metal; (2) coatings applied locally in the form of a drop; and (3) penetration of joints.

In the first case the retraction of the molten coating prior to solidification shows the importance of attraction between the liquid and solid metals. The phenomena is not confined to coatings of tin, but has been observed with other metals. In the second case (which is of experimental rather than practical importance) attention is drawn to the question of fluxes. Their action has not yet been fully elucidated, although it has been shown that they act as cleaners and in some cases markedly lower the surface tension of the metal drop. A subsidiary effect of the flux in limiting spreading was noted and reference was also made to the formation of "halos" round spreading drops. The penetration of solder into joints, although of great practical importance, has received ittle scrientific study. Surface tension is probably more important here than in the case of drops. A brief description was given of a method developed by the authors for studying the height of rise and angle of tin and solders in copper capillary tubes.

Wetting of Skin and Leather

The microscopical and ultramicroscopical structure played a very important part in the wetting of skin and leather by water and oils, said Dr. R. H. Marriott, F.I.C. In addition, the chemical properties also are factors, as well as the polarity of the wetting medium. In wetting dried skins with water, the problem involved the chemical state of the interfibillary proteins rather than the surface activity of the water. In the unhairing process, however, emulsification of some of the fats must be brought about, small additions of caustic soda being of advantage.

In currying and those processes involving the absorption of oil, the chief factors were the polarity of the oil, and the ability of the oil to spread over the wet leather fibres. Owing to the extremely small openings in the outer surfaces of the leather, penetration can only occur if the oil can form a film thin enough to pass through the openings. The process most difficult to explain was that of fat-liquoring and it would appear that for this process to be successful the oil droplets must break on the surface at such a rate that the oil film formed is thin enough just to penetrate. If the film is too thin, *i.e.*, the emulsion breaks too slowly, then the penetration will be too great and will produce poor leather. On the other hand, if the breaking is too rapid the film will be too thick to penetrate and the leather will be greasy.

Mr. W. Esmond Wornam, B.Sc., A.I.C., who presented a paper on "Paints and Varnish," suggested that two different types of wetting should be recognised for paint and varnish; these may be termed the purely physical, which involves a spreading factor, and the physico-chemical, which implies bringing into operation at the interface, forces of a relatively high order of molecular attraction or repulsion. The main difference in the effect of the two types of wetting lies in the fact that a new surface or interface is produced by some form of polar orientation of the wetting liquid in physico-chemical wetting, while with purely physical wetting, the solid surface remains substantially the same. The desiderata, when applied to paint or varnish, are that the wetting shall be produced physico-chemically by the oil type phase, and that the thinner shall assist this end by effecting some initial physical wetting of the surface. Where such physico-chemical wetting cannot be achieved, the adhesion of the film must be assisted by some form of mechanical key. "Cissing," or the receding of the applied material into drops, arises when the physico-chemical repulsion or non-wetting in-influence of the oil type phase dominates the purely physical wetting propensity of the thinner. If the physical wetting of the thinner overcomes the non-wetting of the oil-type phase, delayed cissing may arise, but may be prevented by structures set up in the films; in the latter case, bad wetting manifests itself only as bad adhesion.

The Wetting of Pigments

The wetting of pigments was the essential problem of paint manufacture as distinct from paint formulation, said Mr. G. A. Campbell. Paint grinding is more a process of the wetting and dispersion of the pigment, than any true "grinding" or reduction in particle size. More important than fineness of particle is the texture of the powder. A pigment of good (or soft) texture is one which is easily wetted by its medium. The art of pigment manufacture, apart from maintaining shade and strength, is the control of the texture of the pigment powder. Conditions controlling texture were discussed.

Modifications of the surface of the pigment powder can be affected after manufacture, and several examples were given of special treatments to this end. The saving effected by the use of suitable wetting agents in paint grinding was emphasised. One instance from works practice was cited effecting a saving of as much as half the time and power, by the use of only 0.05 per cent. wetting agent on the weight of the paint. Measurements of liquid absorptions and rate of settling of pigments when thoroughly wetted out in various media were also discussed. It was interesting to note that those wetting agents which give the most marked reduction of liquid absorption also gave the best dispersion and held the pigment best in suspension.

A novel use was suggested of contact angle measurements made upon pressed cakes of the pigment powders. An indication may thus be obtained of the relative wetting powers of different media for a given pigment, and of the effectiveness of various wetting agents. Other questions discussed were the thickening and thinning of paints on storage due to continuous increased or decreased wetting; the "maturing" of paints and the floating of pigments. It was suggested that all are greatly influenced by the wetting power of the liquid and the wettability of the pigment.

Plant Pest Control

The introduction of detergents and wetting our agents effective in the presence of soluble calcium salts made possible a wide extension of the range of supplements for use as "spreaders" in horticultural sprays. In particular it enabled the exploration of the use of combined washes containing both direct and protective insecticides and fungicides. Although field performance determines the value of a new

" spreader," said Dr. H. Martin, A.R.C.S., F.I.C., it became necessary to select by laboratory methods, material most suitable for field trial. An attempt has therefore been made to define the properties which determine field performance and to devise laboratory methods for the evaluation of these properties concerned, *e.g.*, wetting, spreading and penetrating properties of the spreader solution, in influence of the spreader upon the initial retention, tenacity and coverage of protectant spray materials.

Upon the basis of the laboratory examination, it may be possible to assess the suitability of a particular product for field trial. Generalisation upon the various groups of materials available for use as spreaders indicate that the synthetic detergents and wetting-out agents are of special promise, though the hydrocarbon and glyceride oils are potential competitors.

Mechanism of Detergent Action

The mechanism of detergent action was discussed by Dr. Conmar Robinson, A.R.C.Sc.I., A.I.C. The initial and most important part of the process is the displacement of the oil from the fibre by the detergent solution. This involves the contact angle made (in the solution) by the oil-solution interface with the fibre becoming zero. Measurements of contact angles have supported this conception. For this angle to be zero, Adam has shown that the adhesion tension between solution and fibre minus that between oil and fibre divided by the oil-solution interfacial tension must be equal to or greater than unity.

No values for the solution fibre adhesion tensions are at present available. Interfacial tension values are qualitatively in agreement with the detergent action of certain systems. Here is would seem that changes in the interfacial tension run parallel to, or predominate over, changes in the adhesion tensions. In other cases no such parallelism is found. In such cases it is suggested that the explanation would probably be found if the adhesion tension were also determined. Evidence that detergents are adsorbed to different extents on fibres suggests that such adhesion tension differences might be significant. Emulsification which in general takes place in a detergent bath, is considered as a secondary factor, the conditions required for the displacement of the oil also favouring emulsification. Other things being equal, it is probable that a fine emulsion or one whose drops can be easily distorted is desirable.

Internal Solubility in Soap Micelles

Many organic substances are more soluble in soap solutions than in water alone, said Dr. A. S. C. Lawrence. This phenomenon is due to two entirely different causes, although both may be operative simultaneously. Substances soluble in water peptise soap solutions and have their own solubility increased mutually until a saturation value is reached. This is of the order of 6-20 molecules of peptiser per molecule of soap in addition to their normal solubility in water. The attachment in this case is by dipole interaction. The complex is broken down on crystallisation. The second type is that of non-polar substances which dissolve in the interior of the soap micelle. That is in the hydrocarbon tails of the soap molecules. This type of complex is not broken down on crystallisation nor does it affect the chemical behaviour of the unchanged exterior polar groups. Saturation depends on the spaces available in the interior of the loosely packed micelles. When the oil is present, their density is increased considerably. Complex molecules of high molecular weight such as oleyl alcohol are intermediate in that the internal solution mechanism is the main factor in taking up the alcohol, but the dipole interaction follows. The influences of these factors on detergence was briefly mentioned.

A brief account of the factors involved in detergent action, and a description of the composition and properties of certain of the newer detergents was given by Mr. E. T. Williams, M.Sc., Mr. C. B. Brown, M.Sc., and Mr. H. B. Oakley, M.Sc. Ease of removal of dirt depends upon the nature of the detergent, the nature of the surface to be cleaned, the nature of the dirt or soil, the nature of the water employed, the nature of the agitation, and in addition, in any detergent operation regard must be paid to the possible effects of the detergent solution upon the surface being cleaned, and also the person of the user. It has not been found possible to correlate accurately the efficiency of a detergent solution with any single property of that solution, such as capacity for reducing the surface tension against air or against oil, etc. For the evaluation of detergent efficiency an actual detergent test with soiled material seems to be essential. In actual practice with cloth it is usually possible to remove the bulk of the dirt by agitation of the cloth in the detergent solution; some spots of tenaciously held dirt may require rubbing, whilst stained material, such as tea and coffee stains, etc., may require a bleaching agent for their complete removal.

The types of the newer detergents taken for consideration were the Igepons, Gardinols and polyglycerol esters. The capacities of solutions of these detergents for reducing the surface tension against air or against oil, and also their washing properties on soiled cotton and woollen materials were described. In addition, figures were given illustrating the comparatively small amount of fatty matter deposited by these detergents on cloth in hard water, and finally the results of some tests were described on the washing action of these newer detergents in solutions of different *p*H values and also at different temperatures. As might be expected from the composition of the detergents in relation to the composition of wool, the washing efficiency of a polyglycerol ester is less affected by variations in *p*H value than that of either Igepon or Sapamine, and further, the washing efficiency of Igepon on soiled flannel is better at low and medium temperatures than high temperatures.

Detergent Problems of the Wool Industries

Wool combines with alkali, swells and absorbs detergents and other compounds. Such changes affect its physical properties, and therefore its manufacturing properties, and help to decide the " handle " of finished garments. For these reasons, in the raw wool washing process, for examples, the manufacturer is possibly even more concerned about the carding, combing, and spinning properties of the washed wool, than with its cleanliness. Usually a washed wool giving a water extract of *p*H 9.5 is favoured: it is never processed when free from alkali grease or soap.

According to Dr. H. Phillips, F.I.C., the experimental work of King suggests that wool will absorb soap more rapidly from dilute solutions, in which the soap is crystalloidal, than from more concentrated solutions in which the soap exists as colloidal aggregate. The rate of absorption of soap by wool from dilute solutions also suggests that the soap is absorbed into the interior of the wool fibres from a film which is maintained at a constant concentration. Soap absorption by wool from dilute solutions thus appears to follow similar lines to that of the absorption of crystalloidal dyestuffs studied by Speakman and Smith. The adhesion of mineral oil for wool may be increased by the soap film on its surface and possibly the oil may penetrate below the surface of the fibres. The removal of this oil may call for the use of strongly alkaline solutions to swell the fibres and facilitate the penetration of the detergents.

Solvent Action of Detergent Solutions

A contribution by Mr. G. S. Hartley, M.Sc., dealt with the ability of solutions of detergents of the paraffin chain salt type to take up considerable quantities of organic liquids and even solids not soluble in water alone. The mechanism of this solution process was discussed in terms of the properties of the aggregates of paraffin chain ions and the distinction between solutions and emulsions was explained. It was pointed out that emulsions, though they may be very permanent are not, in the thermodynamic sense, really stable, whereas the solution is in a state of true equilibrium. The solutions represented a very much finer degree of dispersion than emul-

sions and intermediate degrees of dispersion cannot be realised. This solvent action is of technical interest in that use is made of it to incorporate in a convenient manner with soaps certain substances, such as cyclohexanol, which have been claimed to be advantageous in detergent processes. The possibility also of the solvent action playing a part directly in detergent processes was considered, but shown on quantitative grounds to be improbable in normal operations.

The mechanism of the penetration of fabrics by detergent solutions was discussed by Dr. J. Powney, with particular reference to the conditions met with in detergent processes. It was shown that owing to the abnormal surface-volume ratios existing within fabrics, adsorption of surface-active material may lead to considerable starvation of the penetrating solution. The possibility that long chain molecules of a detergent solution may obtain access to the inter-micellar spaces of wool fibres was also discussed.

A brief review was given of some of the methods available for the determination of relative wetting powers of detergent solutions. A new electrical method for investigating the penetration of fabrics by detergent solutions was also described. Preliminary results obtained by this method show the dependence of rate of penetration upon detergent concentration, and indicate that the addition of electrolytes to detergent solutions may considerably affect their wetting-out properties.

In the final contribution to this symposium Dr. Eric K. Rideal, M.A., F.R.S., discussed some general factors in detergency, *i.e.*, penetration of the detergent to the accessible surface of the material, peptisation of the dirt on the surface, etc.

International Association for Testing Materials

Provisional Programme for London Conference

THE International Association for Testing Materials has issued a provisional list of the papers to be presented at the international conference in London in April. The conference will comprise four groups, dealing with metals, inorganic materials, organic materials, and subjects of general importance, each of which will be presided over by a distinguished worker from overseas. The last conference of the kind was held six years ago, and every efforts is being made to ensure that the knowledge in this important field will be brought completely up-to-date. There are no fewer than 209 papers in the provisional list, of which 48 are to be presented by representative workers in Great Britain.

Details of the British papers are as follows :—

GROUP A.—METALS.—(*a*) *Mechanical Properties.* R. W. Bailey : Creep and Engineering Design. Dr. W. H. Hatfield : Creep as occurring in Different Steels under Service Conditions. H. J. Tapsell : The Phenomenon of Creep Recovery. (*b*) *Chemical Properties.* Dr. U. R. Evans : Corrosion as influenced by Increased Temperature. Dr. C. H. M. Jenkins : Chemical Properties and Stability of Metals at High Teperatures. PROGRESS OF METALLOGRAPHY. (*a*) *Micro-Macrography.* W. H. Dearden : The Preparation of Specimens for Macro- and Micro-Examination. (*b*) *X-Ray Interference.* Dr. A. J. Bradley : Quantitative Metallographic X-Ray Technique. Dr. H. J. Gough : Characteristics of the Deformation and Fracture of Metals as revealed by X-Rays. Prof. G. T. Taylor : Crystal Lattice and Mechanical Properties. (*c*) *Electron Interference and Emissivity.* Prof. G. I. Finch : The Study of Metal Films and Surfaces by Electron Diffraction. (*f*) *Solidification of Ingots.* Dr. C. H. Desch : The Solidification of Ingots. (*g*) *Recrystallisation.* S. L. Archbutt : Progress in Wrought Aluminium Alloys in Great Britain. Dr. A. G. C. Gwyer and H. G. Dyson, B.Sc. : Recent Progress in Aluminium Casting Alloys. Dr. J. L. Haughton : Recent Developments in Magnesium Alloys. WEAR AND MACHINABILITY. H. E. Smith : Experiments on the Abrasion of Metals. Prof. Dempster Smith : Cutting Tools. F. P. Bowden and T. P. Hughes : The Surface Temperature of Sliding Metals and its Influence on Surface Flow and Wear.

Inorganic Materials

GROUP B—INORGANIC MATERIALS.—CONCRETE AND REINFORCED CONCRETE. (*a*) *Laboratory Technique in Testing the Strength of Aluminous Cement.* Dr. W. H. Glanville : Strength Tests for High Alumina Cement. (*c*) *Development of Heat by Cement.* Dr. F. M. Lea : Comparison of Methods for Measuring the Heat of Hydration of Cements. (*d*) *Sea-Water Cements.* Dr. F. M. Lea : The Testing of Pozzolanic Cements. (*f*) *Shrinkage of Concrete.* F. G. Thomas : Shrinkage Cracking of Restrained Concrete Members. (*g*) *Creep of Concrete Under Load.* F. G. Thomas : Creep of Concrete under Load. (*h*) *Vibrated Concrete.* A. J. Newport : Compaction of Mortar Cubes by Vibration. (*k*) *Influence of the Compressive Strength of Concrete and the Yield Point of Iron on the Degree of Safety of Beams.* F. G. Thomas : The Relationship between the Ultimate Strength of a Reinforced Concrete Beam and the Strength of the Steel and Concrete. (*l*) *Other Topics.* Dr. W. H. Glanville : Grading and Workability. Dr. N. Davey : Influence of Temperature on the Strength of Concrete. L. Turner : The Autogenous Healing of Cement and Concrete : Its Relation to Vibrated Concrete and Cracked Concrete. L. Turner : Plain and Reinforced Concrete in Torsion. EROSION AND CORROSION OF NATURAL AND ARTIFICIAL STONE. (*a*) *Erosion and Corrosion.* R. J. Schaffer : Tests on Building Stones as a Measure of Weathering Quality. (*b*) *Bricks, Tiles.* B. Butterworth : Frost Test on Bricks and Tiles and their Limitations. Dr. N. Davey : Strength of Brickwork in Relation to that of Brick and Mortar. Dr. C. M. Watkins : Effect of Pitch of Roof and Ventilation on Weathering of Clay Roofing Tiles.

Organic Materials

GROUP C.—ORGANIC MATERIALS.—TEXTILES. Dr. H. Phillips : Chemical Tests for Textiles. B. H. Wilsdon, M.A. : Mechanical Tests for Textiles. WOOD CELLULOSE. Dr. Forster : Wood Cellulose. W. G. Campbell : Wood Cellulose. P. McCarthy : Paper. L. G. Cottrall, B.Sc. : Development of Paper Testing in Great Britain since 1930. TIMBER PRESERVATION. J. Bryan : Wood Preservation in Great Britain. AGEING OF ORGANIC MATERIALS. Dr. G. Barr : The Oxidation of Mineral Oils. B. D. Porritt : Mechanical Effects. COLOUR AND VARNISHES. Dr. L. A. Jordan : The Physical Attributes of Paint and Varnish Films.

GROUP D.—SUBJECTS OF GENERAL IMPORTANCE.—V. E. Pullin : Radiology in Testing. Sir Gilbert Morgan : Chemical Researches on Plastic Materials. Dr. S. G. Barker : Soundproofing of Walls. Dr. G. W. C. Kaye and Dr. J. E. R. Constable : The Acoustical Insulation of Buildings. Dr. E. Griffiths : Materials for the Thermal Insulation of Buildings :

The papers will be presented in the form of summaries so that a vast amount of information will be made available in easily accessible form.

A FIRM styled The Mettur Chemical and Industrial Corporation has been formed in India with a capital of Rs. 1,500,000 for the purpose of manufacturing caustic soda, chlorine and bleaching power. The company has purchased Government buildings erected during the construction of the Mettur Dam, and will employ power generated at the dam.

Scientific Research in Industry

A Change in Outlook of British Industry Towards Research

According to the annual report of the Department of Scientific and Industrial Research for 1935-6 (H.M. Stationery Office, price 3s.) the last five years have witnessed "the fruition of the policy adopted by several large industrial undertakings of setting well balanced teams of research workers, including chemists, physicists, engineers and, where necessary, biologists, to solve a particular problem or to develop a new product." This method of attack has led to the development on a commercial scale of the huge plant for the conversion of coal into oil by hydrogenation, to the growth of the plastics industry and to many other important advances. "The future," the report continues, "no longer lies with industries content to make sporadic advances at the call of the brilliant individualist. Co-operation, team work and an extensive organisation on the technical side are essential for success."

Progress of Research Associations

For this reason the department attaches great importance to the development of the co-operative research associations formed under the scheme launched in the early days of its existence. The steady increase in the sum which industry is providing each year for their development gives a good reason "for taking an optimistic view" of their future. In the last three years this sum has increased by 40 per cent. from £167,370 to £232,468. In the same period, the grants from the department for these organisations have increased from £68,212 to £107,451. The year has also afforded other practical evidence of a forward movement in industry regarding research.

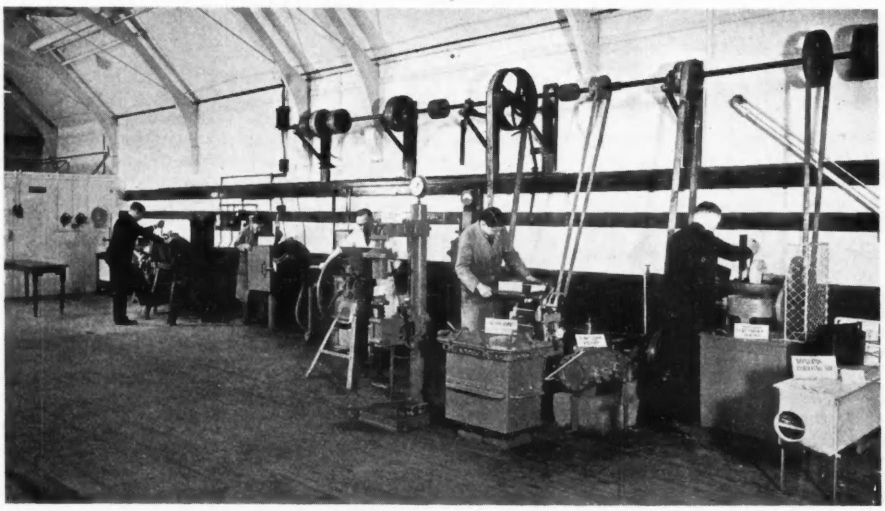
A further 20,000 ft. has been added to the laboratory accommodation of the Paint Research Association. The greatest increase, however, has been at the Shirley Institute, the headquarters of the Cotton Research Association, where extensions to the laboratories had cost £41,000. The area covered by the buildings, accommodating the work of this, the largest of the research associations, now extends over three acres, and the total cost of the laboratories and equipment has exceeded £200,000. In 1920 the cost of the research carried out at the Shirley Institute was £19,000 and the staff numbered 25. Last year its income was £84,000, and the staff employed numbered 270.

In spite of such advances, however, the position of the research association movement as a whole was not yet entirely satisfactory. The Department of Scientific and Industrial Research is prepared to provide a further £66,000 each year to the support of the research associations, and would have been prepared to find that sum in each of the past two years had industry been ready to provide an equivalent contribution. In fact, the income of the associations might have been increased by a further £150,000 a year, of which only half had to be found by industry, if full advantage had been taken of the department's offers which have been made to and accepted by various research associations.

The Fire Offices Committee of the London insurance companies, in co-operation with the Building Research Station, has erected a new Fire Testing Station at Elstree, which will be used for the study of the fire resistance of full scale parts of buildings. The results should be of great value in giving greater confidence in the use of new materials for building construction by removing any fear that the introduction of novel forms of construction may be introducing unknown fire risks. The Institution of Heating and Ventilating Engineers has also provided a new laboratory at the Building Research Station for research on the warming of buildings. It consists of one room built within another and so arranged that any kind of weather conditions can be maintained in the space between the two. The result is that research on heating systems used in the inner room can be continued independently of the vagaries of our climate.

A "consultative group" which brings the shipping industry in close contact with the department's work on the transport and storage of food has played an important part in the rapid development of the new trade in chilled beef with Australia and New Zealand, and in the application of improvements for transporting Empire fruit and dairy produce.

Another striking example is the work the department is carrying out with the co-operation of the Milk Marketing Board on the purification of waste waters and effluents from milk depots, creameries and condensed milk factories. Two different methods have been worked out, and shown to be successful on a large scale, by which the polluting character of milk washings can be reduced by 99 per cent. and 97 per cent. respectively. Investigations have also drawn attention to the losses of milk, cream, whey, etc., carried away in the waste waters. It has been shown that the wastes from this cause can be reduced by nearly three million gallons per year. At the low wholesale price of 5d. a gallon for milk for manu-



The Machinery Section of the Technical Laboratory used jointly by the D.S.I.R. Food Research staff and the staff of the British Association of Research for the Cocoa, Chocolate, Sugar, Confectionery and Jam Trades, at Holloway, London.

facturing purposes, this means, the report points out, a saving of about £50,000 a year to the industry. Five per cent. of the total quantities of by-products, whey, skimmed milk, etc., is frequently lost at present in the waste waters. This loss can be reduced to about 2 per cent. The suggestions put forward for reducing these wastes have already been adopted at several factories.

At the Low Temperature Station, Cambridge, the effect of radiation from radio active substances in destroying bacteria are being studied in connection with the storage of meat. Methods of storing eggs in different concentrations of carbon dioxide are also being tried out on a large scale. A high concentration of, say, 60 per cent. prevents attack by mould and gives an excellent yolk but a very fluid white.

Pork and Bacon

The manner in which the quality of pork and bacon is linked with the growth and diet of the pig is being studied. In the later growth of a pig, changes take place in the chemical composition of the muscular tissues. These start near the head and travel to the tail. This head to tail wave of growth explains why alterations in the rate of growth affect certain parts of the body more than others and influence the

Sir William Bragg inspecting apparatus on the occasion of the opening of extensions to the laboratories of the British Association of Research for the Cocoa, Chocolate, Sugar, Confectionery and Jam Trades, at Holloway, London.

form and quality of the carcass. An ounce of cod liver oil a day may be good for the living pigs but causes the fat to become rancid in curing. Heavy exercise before slaughter, such as rapid walking for a quarter of a mile, makes the pigs' tissues more alkaline than they would have been had the pigs been rested for a day or two. This fact has been found to be of importance in dry salt curing.

Cold Storage of Fruit

Experiments have been made on the "gas storage" of pears. British Conference pears have been stored in refrigerated chambers with the atmosphere adjusted to contain the correct amount of carbon dioxide for long periods, extending well into the summer. When removed from the store the flavour, texture and appearance of the pears were entirely satisfactory. Williams' Bon Chrétian pears are normally very difficult to market because they ripen quickly at ordinary temperatures and remain in an eating-ripe condition for only a few hours. By gas storage, in an atmosphere containing 2.5 per cent. oxygen and 5 per cent. carbon dioxide at 34° F, the particular fruit was held in a marketable condition until the middle of March. On removal from the store at this date the pears ripened to a good quality in just over a week and remained in an eating-ripe condition for two or three days. The correct conditions for gas storage have been maintained on a commercial scale in a 30 ton experimental gas store.

The storage of flour is being studied by the Flour Millers' Research Association. So far it has been found that three factors come into play. First, there is some effect, not yet fully understood, produced by the growth of fungi during storage which improves the baking qualities of the flour. Secondly, there is a factor causing deterioration in its quality owing to the fats in the flour becoming converted into glycerine and fatty acids, and finally there is an indirect beneficial factor resulting from the fungi consuming the fatty acids. It has been found that during storage the bacteria content of the flour diminishes to a small value while the fungi content rises to very high values.

Another investigation being carried out by the Flour Millers' Research Association deals with the staling, flavour and keeping quality of bread. What the housewife usually calls "staling" is due as a rule to poor keeping qualities in the bread. Exhaustive investigations of this aspect of the problem have shown, the report startes, that bread made in the best possible way from the best possible flour will leave little to be desired in the matter of keeping quality. Such bread will retain its edibility for ten or twelve days whereas bread improperly made from poor flour may become most unappetising and almost uneatable in two or three days. Many other factors contributing to keeping quality have been investigated. The results of this work suggest strongly that if more attention were paid to commercially controllable factors promoting good keeping quality of bread the serious problem of stale bread would lose some of its importance.

At the request of the Home Office a preliminary examination has been undertaken of the risk of ignition by sparks due to static electrification in dry cleaning works. Some of the liquids used in dry cleaning produce an ignitable vapour when mixed with air, and explosion may result if the conditions of operation allow the generation of appreciable electrostatic charges. Methods for detecting in the atmosphere small quantities of poisonous gases commonly occurring in certain industrial processes have also been worked out.

Dental Amalgams

Researches for the Dental Board on dental amalgams have been completed during the year. The results have shown, the report states, that the composition of the alloy used in making the amalgam must lie within very narrow limits if the dentist is to produce fillings which will continue to fill cavities without contraction. The precautions which must be observed by the dentist in preparing the amalgam have also been established. The conditions both of manufacture and use of materials for amalgam fillings, have been determined as the result of an extended series of experiments, in which the changes of volume at mouth temperatures have been measured, sometimes over long periods. The results of this work should place this country ahead of the rest of the world in this particular aspect of dentistry.

One of the events of the year has been the inaguration of a section for silk research at the Shirley Institution as a result of the decision to transfer the work of the old British Silk Research Association to Didsbury. Rapid progress has already been made on some of the more pressing problems of the silk industry; in particular on the development of rapid methods for mechanically testing silk fineness.

Extensive trials of the process for producing unshrinkable wool developed by the Wool Research Association as proceeding under semi-manufacturing conditions in a specially erected plant. This plant is being used for the instruction of the operatives of firms working the process, plans for the commercial release of which are now being considered.

Iron and Steel

The annual expenditure of the Iron and Steel Research Council of the British Iron and Steel Federation has increased from £15,624 in 1933 to about £50,000 last year. The research expenditure of individual companies has also considerably increased in the last 12 months. About 35 per cent. of the Council's expenditure is on long range research not cap-

able of immediate application, but of the first importance to the future progress of the industry. The results of other researches have increased productive efficiency, improved quality and are progressively supplying the need for steel capable of standing up to the high temperatures now employed in modern industry.

The Council has collected and examined data regarding existing practice in the industry. This has provided a standard by which the effect of changes can be measured, and has led to rapid improvements in efficiency both in smelting and steel making. This has applied not only to the less efficient plants, but also to those known to be highly efficient. The Council's work has led to a great increase in the degree of control by scientific instruments in steel making, and robust apparatus of high precision for such work is now being made by British firms at prices competitive with foreign apparatus.

In other directions a type of pulverised fuel burner and distributor developed at the Fuel Research Station has enabled twice to three times as much steam to be obtained from a Lancashire boiler as it was normally rated to give. At the Chemical Research Laboratory an improved electrical insulating material has been obtained by the blending of rubber derivatives with synthetic resins from tar. The corrosion of locomotive boiler tubes has also been investigated there by laboratory methods and in a model boiler, and the life of the silica brick linings of gas retorts is now 25 per cent. longer than ten years ago, mainly owing to the work of the Refractories Research Association and the economies resulting to the gas industry therefrom are very great indeed.

The Paint Research Association are investigating the problem of painting in winter and wet weather, and studying how the difficulties can be overcome by some simple modification in the composition of the paint, and apparatus by which paint can be applied and tested under any weather conditions between tropical or arctic has been devised. The Rubber Research Association is working on the development of durable rubber for gas masks, and is devising tests which should ensure supplies of reliable articles to be available should necessity arise. Among other subjects the association is studying the resistance of rubber for shoe soles and heels.

Letters to the Editor

Scientists and Gas-proof Rooms

SIR,—I am prompted to write to you from having read the results of an experimental examination of the precautions prepared by the Home Office for the protection of the public against air raids which has been carried out recently by a committee of Cambridge scientists. Their conclusion that the term "gas-proofing," as applied to living-rooms in houses, can "mean nothing more than the delaying of the effectiveness of a poison gas and that it has nothing to do with making such rooms impervious to gas" seemed to me to accord so well with generally accepted and elementary facts regarding hygiene and ventilation that it can scarcely be questioned or gainsaid. Yet I read with astonishment that in replying to questions put to him on the subject in the House of Commons recently by two private members (Mr. Duncan, C.—North Kensington, and Mr. Sorensen, Lab.—West Leyton) the Under Secretary of the Home Office (Mr. Geoffrey Lloyd) superciliously dismissed the Cambridge experiment with the gibe that "it is not clear whether their interest is primarily scientific or political." This answer, which is reported to have been received with "Ministerial cheers and laughter," shows how callous and shallow is the mentality of the Government's supporters towards a question of supreme public importance.

I hold no brief for the Cambridge committee or its findings. But, however regarded, they cannot be dismissed by mere words, but should be either disproved or substantiated by some competent scientific body, independent of Whitehall, so that the public mind may be set at rest on the subject. Personally, I gravely doubt whether any ordinary living-room in a private dwelling-house can be rendered so adequately or effectively "gas-proof" as to afford any real protection for its inmates against poison-gas attacks during air raids. I regard the official supposition that such "gas-proofing" is a "fairly simple" matter as a dangerous delusion calculated to lull the country into a sense of false security from which it will be rudely awakened should the danger ever materialise.

Rightly viewed, it seems to me that the problem is not merely one of rendering a living-room effectively "gas-tight," which doubtless could be done at considerable trouble and expense, but one which is complicated by the fact that human beings shut up in such a room breathe air and require a certain minimum of ventilation, necessitating air being continuously supplied to them from without. Each adult human being consumes some 0.75 c. ft. of oxygen and exhales some 0.65 c. ft. of carbonic acid (besides water vapour and deleterious organic matter) per hour. It is usually considered that in order to prevent undue vitiation of the atmosphere in living-rooms at least 1,000 c. ft. of air per head of its inmates should be supplied per hour. Doubtless in an emergency a lesser quantity would suffice for short periods; but it is clear that ventilation could never be cut down to zero and that at least the minimum requirement of ventilating air would have to be derived from the outside atmosphere.

Thus, for example, a room (say) 20 ft. by 15 ft. by 10 ft., or of 3,000 c. ft. capacity, constituted as a refuge against poison gas for a household of five to seven persons during an air raid would have to be supplied with at least about three thousand c. ft. of fresh air per hour if its inmates are not to suffer extreme discomfort from the products of their own respiration. How, then, can it be rendered "gas-tight" with safety to the people in it? And how can sufficient air for them be allowed to enter from outside without simultaneously admitting any poison gas that may be present in the outside atmosphere?

I would, therefore, ask whether it would not be more becoming, and in keeping with their duty to the nation, for Ministers of the Crown and those having authority under them to bring their minds to bear upon such elementary aspects of the problem as the foregoing instead of sneering in Parliament at the efforts of scientists, whether in Cambridge or elsewhere, who are endeavouring to enlighten the public about them? And, in particular, will they explain how it would be hygienically practicable to render a living-room in each and every house "gas-tight" as a refuge for its inmates against poison gas during air raids by stopping up every crack, crevice, or pore in its windows, door, floor, or walls so that no air can enter it from without?

Had it better not be recognised by all concerned that there neither is nor can be any effective protection of the inmates of houses against poison gas during air raids and that if nations want to escape the unspeakable horrors of air raids they must abandon and outlaw war and agree to settle their disputes by arbitration? For civilisation either must make an end of war or assuredly war will end it.—Yours faithfully,

WILLIAM A. BONE.

St. Albans.

THE Japan Synthetic Industry Co., formerly the Japan Tar Industry, is preparing shortly to place on the market two new products known as Dye Allied 10G and Dye Allied Red C, which will be sold to the domestic printing ink industry. These dyes are reported to compare favourably with the German red lakes.

Ten Commandments for Chemical Workers

Fundamentals of Safety

MR. JOHN S. SHAW, manager of the safety and service department of the Hercules Powder Co., Wilmington, Delaware, in a paper on "Fundamentals of Chemical Safety" in the Chemical Section of the 25th United States National Safety Congress, urged that every industrial and chemical worker should be acquainted with the following ten safety items:

1. A chemical worker should be thoroughly familiar with the location and use of water hydrants, safety shower baths, fire blankets, exits, and fire fighting equipment. He should be shown through the medical or first aid department and understand the importance of reporting promptly for first aid treatment for injury resulting from contact with any chemical, as well as for physical injuries. He should be trained in first aid and his training reviewed at least every three years. Competent instructors should give the training.

2. The chemical worker should keep in a safe and proper place, always ready for use, any protective equipment supplied him, such as goggles, rubber gloves, aprons, boots, or other articles. Gas masks, whether they are hose or canister type, should be tried on at regular and frequent intervals to make sure they will be working properly when needed. A canister, if equipped with a recording device showing the strength of the chemicals contained has diminished materially, should not be returned to its original place but should be discarded immediately, before it is entirely exhausted. If there is no recording meter on the canister, it should be discarded at the end of each year; but if used, it should be discarded immediately after use.

Canisters should be kept sealed until used, but the sealing must not be forgotten when the mask is put into use. Loss of life has occurred through failure to remove the adhesive seal from the bottom of the canister in times of emergency and excitement.

Care of Safety Masks

The hose mask should be kept in good condition, hose and fittings tight, and no part of the equipment used if cracked, old, or in a questionable condition. There should be sufficient hose to reach fresh air, and if the hose mask is used where the maximum length of hose required indicates the need of an air pump, the air pump should be inspected regularly to see that it is in good working condition; likewise, the steel tiller rope or chain and harness which are to be attached to the body of the operator should be carefully inspected. Thorough instructions and drills in the proper use of such equipment may mean the saving of life and the chemical worker should realise his personal responsibility to rehearse for emergencies. Supervision should see that he does this.

The importance of mental rehearsals of emergencies should be emphasised. Every chemical worker should not only experience physical rehearsals, such as safety drills, and life saving, but he should each day at the work imagine emergencies which might arise and mentally rehearse what he would do if something should go wrong. This is very important in the training of the chemical workers and not only does it lead to a broader knowledge and appreciation of his job, resulting in safer and more efficient operations, but often it has a direct bearing upon the creative impulse, resulting in improvements and inventions. As an example, the reply to the question: "What should we do in the case of low water in the boiler?" is "Haul fire and 'haul freight.'" In other words, draw the fire and make quick escape. Every man should do all he can to save life and property, and when he had done this, he should save his own life.

3. Exits should not be blocked at any time, not even momentarily, in the chemical plant, for the unforeseen may happen at any time, when quick escape may be necessary.

4. When going on duty, the chemical operator should satisfy himself that the operating equipment he is about to use is in good condition and working normally. He may receive warnings or instructions from the previous shift operator, and from his working superior, but, at the same time, he should take nobody's word for the "lining up" of valves on chemical, gas, or liquid lines, electrical switches, etc. He should go over his equipment and personally "line up" his own valve set-up, or whatever it may be.

In handling chemicals, nobody's word should be taken by the man who is responsible for moving a chemical from one place to another as to how the set-up exists, unless, of course, it be through long distance and then by specified methods of signalling, such as telephone, bell, whistles, etc., where the set-up at the other end is the duty of a fellow-operator.

Liquids Dropping from Above

5. Oftentimes, spills of liquid chemicals occur and when an operator observes a wet place on the floor, he should realise that he must not look up until he has retreated to a point where there will be no danger of splashes into his eyes or on to his body. This is an old rule of chemical workers, handed down from the age when chemical leaks and drips were frequent.

6. The chemical operator should realise that the control features on all chemical equipment are there not only for operating purposes, but, in most cases, for safety; and in the event that any pressure or vacuum gauge, thermometer or what not indicates abnormal change or a bad condition, he should take steps immediately to rectify the condition as specified by his superior, usually by reporting the condition promptly. However, there are emergencies when he must safeguard the situation before reporting. It is taken for granted that these emergency conditions are provided for in his training. It is impossible to do more than generalise on this without the danger of misunderstanding.

7. While "a little knowledge is a dangerous thing," the more the worker knows about the reasons for following prescribed methods, the better worker he is. He should acquaint himself with the reasons, and, if possible, be familiar with the simple chemistry and physics of his job, and not be afraid to ask questions; but he should never experiment without the advice of proper authority.

Changes in Operating Procedure

Chemical control should not be treated lightly. Any changes to be made in the chemical process should take place only after the careful consideration and direction of those competent to make such changes.

8. When leaving his work, or outlining his duties to another at the termination of his shift, the chemical worker should fully familiarise his successor with the condition of the equipment and the status of the chemicals in process. This should be in writing in a log book of operations. By no means should he leave any questionable condition whereby his fellow worker may meet with a mishap. It is his full responsibility to live up to this and to consider it as sacred as anything in life. The slightest deviation from this practice, whether deliberate or otherwise, has meant disaster.

9. The chemical plant is no place for monkey business or horseplay. It must be remembered that the practical joker in chemical work may be a potential killer. Chemical workers have been known deliberately to plug condensers in order to see if their fellow workers could quickly discover and locate the trouble. Such methods should not be resorted to.

10. The chemical worker should thoroughly appreciate the fact that safety is sacred, that the safest method is generally the best method, and that the best method always embraces the safest way.

The Selection of a Suitable Heat Insulation Material

A Paper Read Before the Institute of Fuel

IN these modern days it is quite unnecessary to stress the importance and value of thermal insulation, said Mr. J. S. F. Gard, B.Sc., A.I.C., at the commencement of a paper read before the Institute of Fuel in London, on February 10, when Professor C. H. Lander presided. Some 20 years ago, and even later than that, insulation was given little consideration, and so long as an uncomfortably hot surface was covered with something which would not perish, that was deemed sufficient. In later years much work on the theory of insulation and comparison of values has been done by the National Physical Laboratory, the Mellon Institute in America and individual firms specialising in such commodities; thus the present state of knowledge of the subject, whilst not being by any means complete, is now fairly compresensive.

The Need for Heat Insulation

It is now also an accepted fact that wherever an intentional temperature differential exists and has to be maintained it is essential to employ thermal insulation. The point at issue is to decide which of the available materials is most suited to the job in hand and the economic expenditure justified. The latter depends largely on the cost of a unit of heat or cold. As a general rule the greater the temperature difference required the greater the cost and the more insulation can with advantage be utilised. Another use for insulation almost as important is the introduction and maintenance of comfortable conditions of existence, such as the insulation of buildings against solar radiation in the tropics.

The application of non-conducting materials was not placed on anything approaching a scientific basis until the middle of the nineteenth century, when Peclet, the famous French physicist, investigated the conduction of heat through materials and the emission of heat from their surfaces, and deduced the fundamental laws upon which modern theory has been built. About 1880 a mixture of magnesium carbonate and asbestos fibre was used with success as a non-conductor in America, and in 1903 its manufacture was commenced in Great Britain by the Washington Chemical Co., Ltd., which has been making magnesia on a commercial scale since 1840 under the original patent of Hugh Lee Pattinson, F.R.S.

Cork Insulation Compositions

Cork as an insulating material was developed in 1890 by a German firm which produced an impregnated cork board. This was superseded in 1893 by a pure cork board manufactured in America under the patents of John Smith, of New York, who, on accidentally dropping a canister of granulated cork into a fire, discovered that the granules bound themselves together. This form of insulator was not manufactured in this country until 1909. At present magnesium carbonate and pure cork board are the most widely used non-conductors for medium and low temperature work respectively. The production of special insulators for high temperature work is a much later development, probably dating from as recently as 1916.

A survey of the basic materials available and suitable for thermal insulation indicates that these are distinctly limited, and it is by varying combinations of these basic materials that the majority of finished products are evolved. The range of insulators can be roughly split up into groups according to the temperature :—

(1) *Low Temperature Range—below 200° F., i.e.,* refrigeration, transporters for ice, solid CO_2, ice cream, etc., cold storage, air conditioning, cool-water systems, hot-water systems, storage tanks, tank wagons (road and rail), buildings, etc. For such uses the most commonly used materials are granulated cork, cork board, wood (ordinary and special), wood pulp, pulp boards, straw boards, grasses, charcoal, sponge rubber, mineral fibres, aluminium foil, etc.

(2) *Medium Temperature Range—200° to 700° F, i.e.,* boilers, steam lines, steam accumulators, hot-air systems, drying plant, flue gas ducting, turbines, cylinders, tank wagons (road and rail), etc. In this range the most used commodities are 85 per cent. magnesia-asbestos, other magnesia compositions, diatomaceous compositions, slag wood, spun glass, felted asbestos, bonded asbestos, asbestos mattresses, asbestos paper and millboard in various manufactured forms, aluminium foil, other metal foils and sheets, etc.

(3) *Moderately High Temperature Range—600° to 1,200° F,* i.e., superheated-steam plant, ovens, stoves, Diesel engine exhausts, etc. Here the choice is more limited and is restricted to asbestos (up to 850° F), spun glass (up to 900° F), Kieselguhr, asbestos compositions, magnesia-Kieselguhr-asbestos compositions, aluminium foil, etc.

(4) *High Temperature Range—1,000° F. upwards, i.e.,* kilns, furnaces, gas-retort settings, regenerative stoves, blast furnaces, hot-blast mains, gas producers, coke ovens, etc. The choice of materials is here restricted to silicas and clays, natural and manufactured in various forms.

First Considerations in Selection

The first consideration on the matter of selection is the temperature range in which the plant falls, then the greatest efficiency compatible with the lowest first cost, which is governed by the economic value of the heat units to be conserved, and the environment; lastly the final protection of the insulation must be decided. The guaranteed annual saving in heat by the various grades of material and thickness considered should be set against the interest upon the capital outlay. By this means also what is usually termed the economical thickness is ascertained, for a point will be reached where an additional increment of thickness will not be justified by the extra saving effected. The bulk of the saving is ensured by the primary thickness applied, subsequent increments having proportionally less effect, since the reduction of heat loss does not vary directly with thickness.

Insulating materials should not be purchased by weight unless the covering capacity is known, but rather by the unit of surface area, or lineal run of pipe covered to a given thickness; moreover, the lighter materials are usually the better insulators, and therefore a given weight will cover a greater surface with better effect.

The National Physical Laboratory at Teddington is well equipped for testing the thermal efficiency of insulating materials in order to compare the manufacturers' "guaranteed performance," and a visit there is most instructive and helpful. The equipment of manufacturers' testing laboratories is more or less based on N.P.L. practice, but is usually modified to suit individual ideas and requirements; nevertheless results obtained are in close agreement with N.P.L. results and are strictly comparable.

In the heat-testing laboratory with which the author is connected there are three general methods in use, viz., (1) the guarded hot plate, (2) the hot pipe and (3) the brick testing box. In the guarded hot plate test a slab of the material is placed on the upper side of an electrically heated plate, surrounded by a ring separated by a ⅛-in. gap from the hot plate proper. The upper face of the material, which is preferably not more than 1 in. thick, is in contact with a water or brine cooled plate; on the under side of the hot plate is a slab of insulation underneath which is a second hot plate; the whole is enclosed in a heat-insulating medium. Thermocouples are stationed at suitable points and electrical energy is supplied to the two hot plates and guard ring and so regulated that temperatures are uniform; the lower hot plate prevents downward passage and the guard ring lateral passage of heat from the test area, thus ensuring that all the heat generated in the test area passes directly upwards. When temperature

equilibrum is reached throughout, the heat generated in the test area of the hot plate is the amount of heat passing through the specimen for the measured temperature difference; from the data thus collected the thermal conductivity can be calculated.

The Hot Pipe Testing Technique

The hot pipe test is designed for determining heat transmissions through and thermal conductivities of pipe sectional coverings and flexible insulations. In principle it is the same as the hot plate method. In the case, however, the insulation surface is exposed to the air, and practical difficulties arise in measuring the surface temperature. These are due to the necessity both of getting the actual junction of the thermocouple at the exact surface of the insulation, and avoiding the use of an instrument which will upset surface conditions.

The brick testing box is intended for testing standard 9 in. by 4½ in. bricks and is based on a method originally worked out and published by Professor Cobb, of Sheffield University. A heater unit measuring 9 in. by 4½ in. by ½ in., consisting of resistance wire embedded in sillimanite, is supported in a large box of kieselguhr; on this the brick specimen, prepared by grinding the two large faces flat and parallel, is placed with a platinum thermocouple stationed between them at the centre to give the hot face temperature; a second thermocouple is fixed at the centre of the upper face, which is then covered by a brass plate, a circle of about 2 in. being cut out of the centre and replaced with a 1/16 in. space packed with asbestos; a third thermocouple is threated through from the edge to the centre of this plate just under the surface, to record its temperature. The whole is completely surrounded by kieselguhr with the exception of the upper surface of the brass plate. The top surface is painted dead black to give black body radiation which enables the heat loss from its surface, and so the heat passing through the test specimen, to be calculated. From the data collected when equilibrium is established the thermal conductivity can be calculated.

Expression of Thermal Conductivity

Thermal conductivity is usually expressed in this country as the number of B.Th.U. passing per sq. ft. per hour through a thickness of 1 in. of material with a difference of temperature of 1° F between its faces. Its dimensions are therefore

$$\frac{\text{B.Th.U. in.}}{\text{ft.}^2\ \text{hr.}\ ^\circ\text{F.}}$$

which is frequently loosely written as B.Th.U./sq. ft./hr./° F./in.

The coefficient of thermal conductivity of a substance is defined on the British system as the quantity of heat in B.Th.U. which flows per sq. ft. per hr. through a 1 in. thickness of the material for a difference of 1° F between the faces. The thermal conductivity is not a constant value under all conditions, but varies with the temperature at which it is considered. For a flat surface

$$Q = \frac{K\,(t_1 - t_2)}{L}$$

where Q is the heat flow in B.Th.U. per sq. ft. per hr.; t_1 is the temperature of the hot face in ° F.; t_2 is the temperature of the cold face in ° F.; K is the conductivity in B.Th.U. per sq. ft. per hr., per 1° F. temperature difference and 1 in., thickness at the mean temperature between t_1 and t_2; and L is the thickness of material in in.

Conductivities are sometimes expressed for thicknesses of 1 ft. instead of 1 in. Both modes of expression are in use. If K is expressed per 1 ft. thick, then L will be taken in feet. The mean temperature is

$$\frac{t_1 + t_2}{2}$$

Where a given area is considered, the expression becomes

$$Q = \frac{AK\,(t_1 - t_2)}{L}$$

where Q is the total heat flow in B.Th.U. per hr., and A is the area in sq. ft.

In a covered pipe (or cylinder) the insulation section is annular and the foregoing expressions do not apply, but from mathematical considerations it can be deduced that the following formula will give the heat transmission for a homogeneous cover.

$$Q = \frac{2\pi\,k\,(t_1 - t_2)}{A\left(\log_e \dfrac{D_2}{D_1}\right)}$$

where Q is the heat transmission per sq. ft. of pipe surface; K is the coefficient of thermal conductivity of the covering; t_1 and t_2 the inner and outer surface temperatures of the covering; A the pipe area per foot run; D_1 the outer diameter of the pipe; and D_2 the outer diameter of the cover.

Where several layers of different conductivity are employed the formula becomes:—

$$Q = \frac{2\,\pi\,(t_1 - t_4)}{A\left[\dfrac{\log_e \frac{D_2}{D_1}}{k_1} + \dfrac{\log_e \frac{D_3}{D_2}}{k_2} + \dfrac{\log_e \frac{D_4}{D_3}}{k_3}\right]}$$

where the successive layers have diameters of D_2, D_3 and D_4 and conductivities of k_1, k_2 and k_3 respectively and t_4 is the final outer surface temperature

In the above formulæ t_2 (or t_4) is the temperature of the surface and not that of the surrounding air. All calculations depend upon a knowledge of this temperature; in fact, as will be shown later, the "external" method of calculation depends entirely upon this. Surface temperature presents the great difficulty of linking up theory with its application, since the basis of all such application is the experimental determination of this value. Surface temperatures for 85 per cent. magnesia on a pipe of 6 in. internal diameter with atmospheric temperature of 70° F and calm condition are given in the following table:—

Internal	Thickness of Covering					
Temp. ° F.	1 in.	1½ in.	2 in.	2½ in.	3 in.	4 in.
100	75	74	73	72	72	71
200	91	86	83	80	78½	76
300	107	98	93	88	85	82
400	123	111	102	96	91	87
500	139	123	112	104	98	92
600	155	135	122	112	104	98
700	171	147	132	120	110	102

Points from the Discussion

Dr. T. BARRATT, referring to Mr. Gard's researches on the influence of size and configuration of pores upon the thermal conductivity of insulating substances, suggested for consideration a substance known as "Aerogel," which was a processed water glass, and could be prepared so that is possessed exceptionally small pores. A paper on the subject was issued by the University of Illinois. It offered advantages in use at high temperature, and would withstand 1,500° F without apparent breakdown of structure. Experiments in the United States had shown that the gel could be made to contain pores of dimensions of 0.1μ (roughly 1/230,000 of an inch), and in that state its thermal conductivity was actually 10 per cent. less than that of still air.

Dr. SAUNDERS said he had thought that, as insulation was almost entirely a matter of porosity, one could not do better than use a material having as large a percentage of pore space as possible, the pores being filled with air and having a conductivity approaching as nearly as possible that of air. The idea of producing materials having very small pores in order to reduce the conductivity to below the normal conductivity of atmospheric air seemed to offer distinct possibilities.

Dr. G. W. ANDERSON said that although gas production showed a high percentage efficiency, *i.e.*, well over 80 per cent. —there being roughly only 15 per cent. heat loss in the process of gas manufacture—the gas industry was not averse to the application of more modern methods of heat insulation as they became available. One method of heat insulation which in his view was far too little used, was that of applying secondary air ducts to the surface of the furnace instead of placing them haphazardly inside.

Dr. G. E. FOXWELL said that one valuable advantage of insulation was that it often prevented air entering a structure, such, for instance, as the front of a coke oven regenerator. He had seen many coke oven regenerators which had opened slightly during use so that one could see the hot material inside. By providing insulation one could not only improve the efficiency of the coke ovens, but could also prevent the air leaking up, and he asked if there were available plastic insulators which could be put on after a coke oven was built, and which did not require a tie in front of them.

Mr. GARD replied to some of the points raised in the discussion. Experiments on the insulation of gas retorts, he said, indicated that a great increase of efficiency could be secured by means of insulation, more particularly by securing more even heat towards the mouth of the retorts. He knew of no satisfactory plastic material for the front of coke ovens.

*p*H Control in Textile Works Practice

A Plea for the Pooling of General Knowledge

A MEETING of the Manchester Section of the Society of Dyers and Colourists was held at the Constitutional Club, Manchester, on February 19, when a paper entitled "*p*H Control in Textile Works Practice" was read by Mr. John Muir, M.A. Mr. N. Chappell presided.

Mr. Muir said that he thought it would be true of most people engaged in industry that they were so obsessed by the necessity for the economical and satisfactory production of whatever type of goods they were manufacturing that unless they could find some cogent reason for a more or less elaborate method of control or of manufacture they tried to avoid it. In other words, they had been thrown back upon something which approached very nearly to trial and error in their final decisions about methods of production. There were those probably who would authoritatively challenge that statement, but, personally, he made it with no real reserve except that he did not suggest that chemists had actually reverted to the careless methods of production of byegone years, when they added a little drop of something to a dyestuff solution and found it worked better, but it was too purple, so they added a little green, and finally obtained a shade of which the customer did not complain.

More Control Needed

What he did suggest was that almost over the entire range of dyeing, printing, and finishing economic use had not been made of scientific methods of control to the extent which would have been possible if the conditions of business had been less strenuous commercially. He took the *p*H control as a suitable example of an elementary type of control to which attention should be devoted. The fundamental objection to the adoption of such a system of control was that it might prove too costly to maintain in commercial practice, but if it was found, in fact, that a method was too expensive to maintain it could always be scrapped at once. A method could only be costly if in actual practice money was being lost by it.

Recently, when he had read a paper upon the same subject before the International Congress of Chemists and Colourists at Stuttgart, it was suggested to him that one could not assume that one's fellow chemists were well versed in the theory of the subject. He was quite willing to deal with its theory to some extent, but he felt that it would probably be of greater service for him to put forward certain practical suggestions founded upon experience. The theory was available to all through the medium of text books.

Most solutions which had to be analysed in the case of chemical work were not acids or alkalies of uniform composition, but contained a large number of other materials. In such cases the determination of the total acidity by titration would give no clear conception of the real hydrogen ion concentration. Many admixed substances and impurities found in solutions to be tested acted as buffers.

The practicability of dilution without changing the *p*H value would prove valuable where solutions were concerned which, on account of their own colour or their turbidity, could hardly be subjected to an indicator test without suitable dilution. Pure water was an unbuffered liquid. Since water had no buffer action its *p*H reaction was modified by the very least addition of other substances and by the influence of carbon dioxide from the atmosphere. For this reason, distilled water never had the *p*H value of 7, which was theoretically attributed to it. It was generally somewhat less and showed a slight acid reaction. Water that had been exposed to the air, and which had absorbed carbon dioxide to equilibrium, had a *p*H value of 5.7.

It should be made very clear that electrometric methods of determining *p*H value were disappointing only when they were not satisfactorily carried out. The electrometric method was, without doubt, the one which should be used for accurate determinations. The indicator method was the best approximation, but it was an approximation which, in less experienced hands, led to less error than would be the case with the electrometric method in respect to which there were many excellent instruments available. There was no great need to persuade people to determine *p*H values from time to time, but there did appear to be great need to persuade them to determine *p*H values as accurately as they could all the time in textile processing. A simple form of comparator for the indicator method was supplied by British Drug Houses, Ltd., and there were buffer solutions containing the appropriate indicator standardised to various *p*H values.

After describing various indicator methods Mr. Muir said that it was very important to ascertain the *p*H value of the aqueous content of a fabric. In the bleaching process he considered it important to take the *p*H value of the fermentation steep regularly and chart the results of the tests. In dealing with a de-sizing material everything depended upon what the material might be; whether it was of malt origin or was a biological enzyme. In the case of fermentation steep *p*H control should be considered alongside temperature control. All washing processes should be subjected to *p*H control, the work being carried out either by the foreman or his charge hand, the results being entered in a book, and afterwards checked in the laboratory.

Salt Content

Closely linked with *p*H value and the acidity or alkalinity of a fabric or a fabric content was the question of salt content. The existence of microscopical quantities of salt had a serious effect upon a final result. If large quantities of soap or alkali were used in the dyeing then the taking of *p*H values in the dyeing process would not be much help. The taking of the *p*H value was important in regard to print thickening, particularly in regard to modified starches. Modern finishing preparations were apt to make the user forgetful of the fact that because they were themselves so stable they were a danger to the condition of the final finish. He made this remark with all due respect to the suppliers of the preparations. In the old days, if one had finished something which was a trifle acid, sodium stearate would fix it all right, and put out a fairly safe material with perhaps rather a heavy cloying finish, but safe enough so far as stocking was concerned.

In conclusion, Mr. Muir urged his hearers not to keep their experience, in speaking in general terms, to themselves, because the real hope of further success for the industry was the pooling of general knowledge.

Luxurious Laboratories at Laportes

Opened by Professor F. G. Donnan

PROFESSOR F. G. DONNAN, president-elect of the Chemical Society, opened a group of magnificent new laboratories at the works of B. Laporte, Ltd., at Luton, on Wednesday, in the presence of a large number of guests, including Dr. Herbert Levinstein, president of the Institution of Chemical Engineers, Dr. William Cullen, Mr. W. A. Damon, chief inspector of alkali works, Mr. W. A. S. Calder, Dr. F. H. Carr, Mr. H. W. Cremer, Dr. L. H. Lampitt, Mr. W. McNab, Mr. F. C. Harwood and Mr. J. Macara. Preceding the opening, there was a luncheon at the George Hotel, presided over by Mr. H. Arnold, chairman of the company.

Mr. ARNOLD gave a short history of the business, established 90 years ago by the late Mr. B. Laporte, first at Bradford and then at Luton, and referred to the fact that when Mr. Laporte, through physical disabilities, decided to form a company, he (the chairman) was one of those whom he invited to join the board. For many years the company carried on in premises the total area of which was no greater than that occupied by the new laboratories. In the early days of the war the company moved to the present site and the succeeding years had witnessed great developments. Originally 90 per cent. of the products were sold locally; to-day they went all over the world. Business associates had been incorporated in the company, an outstanding development being the production of titanium pigments, and the formation of their associated company, National Titanium Pigments, Ltd.

PROFESSOR DONNAN, in proposing the toast of the laboratories, said he had been concerned with laboratories for a great many years. He had a hand in the conversion of the museum at the Dublin Royal College of Science into a laboratory, and later at Liverpool he had the pleasure of meeting Dr. E. Muspratt, who presented the Liverpool University with laboratories costing something like £20,000. He congratulated the company upon its forward-looking policy. The new laboratories were really splendidly designed. "I do not think there are any better designed laboratories in this or any other country," he added. Chief credit was due to Mr. I. E. Weber, who was an old student of his. He had greatly rejoiced in his progress; joining the company 19 years ago he was now a director and chief chemist, and he had been responsible for many important developments, culminating in the present outstanding achievement.

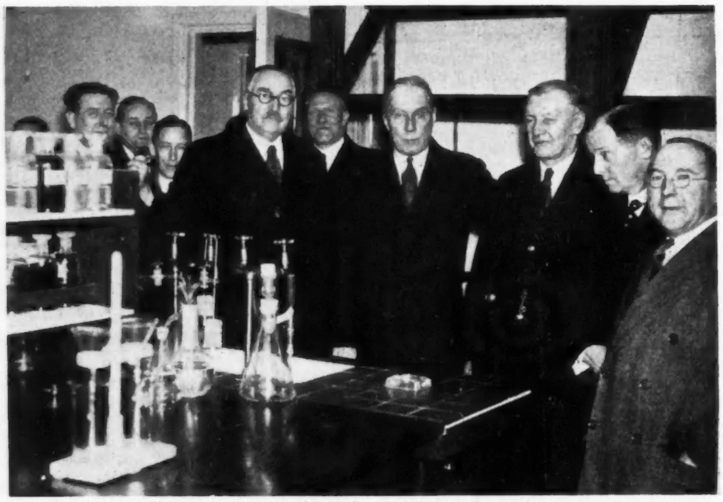
Mr. I. E. WEBER, responding, said when it was suggested that the laboratories should be officially opened, only one name presented itself—for not only did Professor Donnan know his colleague Mr. Sutherland in Mr. Sutherland's Queensferry days, but he (Mr. Weber) had the privilege of being an old student of the Professor's. Professor Donnan had had a vast experience of laboratories both inside universities and in chemical works. He had said there was a "certain something" about these laboratories which reminded him of those of University College. That was not surprising for when he came with Professor Donnan's blessing to the old Laportes some 20 years ago and saw that dark dingy room which was allotted to him and called the laboratory, he made up his mind that one day there would be laboratories here worthy of both B. Laporte and University College.

The planning of the laboratories was an example of the team work for which Laportes was noted. With the help of his staff, and particularly Mr. Purdon, they were able to plan and explain to the architect, Mr. Briars, just what they wanted, and he had given it to them in full measure.

Sir Thomas KEENS, director, proposed the toast of the guests, to which Alderman C. C. Dillingham, Mayor of Luton, and Dr. H. Levinstein responded.

Analytical and Research Facilities

The party afterwards proceeded to the laboratories where Professor Donnan, presented with a key by Mr. Briars, the architect, formally declared the new premises open. After an inspection of the laboratories, the visitors were entertained to tea. Mr. Arnold presented Professor Donnan with an inscribed silver cigarette box as a memento of the occasion, and Mr. W. A. S. Calder voiced the thanks of the visitors to the directors for their hospitality.



Professor Donnan inspecting the laboratories after the opening on Wednesday.

There are two analytical laboratories; one general, one process. The process laboratory has a separate access jointly with the sampling department and records, to give easy access to workmen and also to provide for general cleanliness. The research laboratories comprise (a) general research, (b) private research, (c) titanium research, (d) paint and pigment research, (e) laboratory for research on applications of products, including bleaching of textiles, and (f) process development (machinery) laboratory. There is in addition a physics laboratory with dark room, library, and records office and apparatus stores.

Ample provision has been made for storing samples of goods inwards, and outwards, including batch samples taken during the processing of materials. This store will hold 35,000 bottles of the mixed sizes normally used. The sampling room has machinery for grinding and crushing samples. All the electrical switches and fuses are contained in a small central room so that these are readily accessible.

The total floor area inside the laboratories is 11,000 sq. ft. Fresh air is supplied by a fan which draws the air through an oil filter and conveys it along a duct above the corridor. The used air is extracted by means of a duct below the corridor. Heating is provided by panel radiators with a heating surface of 1,800 sq. ft.

The duct below the corridor is also used to carry the services to each of the laboratories. These services consist of steam, water, gas, compressed air, vacuum, distilled water, hot water for radiators, and electric cables. Distilled water is provided for every laboratory and is serviced through a tin main by gravity flow from a stoneware storage tank. In the textile laboratory softened water is provided and is on tap, both hot and cold. The laboratory staff consists of 40 persons and ultimate accommodation can be made up to 60.

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Personal Notes

PROFESSOR G. G. HENDERSON, D.Sc., LL.D., who has held the Regius Chair of Chemistry in Glasgow University since 1919, has intimated to the University Court his intention of resigning as from September 30. This resignation will mark the close of a lifelong association with the University, for Professor Henderson graduated there in 1881 and, after a period of post-graduate training under Professors Wislicenus and Wiedmann at the University of Leipzig, was appointed an assistant professor of chemistry at Glasgow in 1884. Eight years later he became lecturer in chemistry at the new Queen Margaret College, which he helped to equip and organise, and, in 1892, was elected to the Freeland Chair of Chemistry in the Royal Technical College, Glasgow, but he returned to the University in 1919 as Regius Professor of Chemistry. Professor Henderson has also been actively connected with the societies, having been president of the Institute of Chemistry, Section B, of the British Association, the Chemical Society and the Society of Chemical Industry. Many papers have been published as a result of Professor Henderson's work on branches of both organic and inorganic chemistry; he is perhaps most famous for his original research work on the chemistry of the terpenes.

Professor G. G. Henderson, D.Sc., LL.D.

MR. J. GERSTLEY, and Mr. F. Lesser have been appointed joint managing directors of Borax Consolidated, Ltd.

SIR JOHN CADMAN, chairman of the Anglo-Iranian Oil Co., has joined the Canadian Pacific liner "Duchess of Atholl" for a four-week cruise to the West Indies.

MR. ROBINSON WATERFALL, of Yealmpton, Devon, managing director of the Anglo-Continental Guano Works, and a director of Gibbs' Fertilisers, left estate valued £20,503, with net personalty £18,044.

MR. ROBERT SIMON BRUCE, Jedburgh, Roxburghshire, of Wright and Bruce, and partner of Joseph Rawdin and Co., agricultural chemists, Jedburgh, left personal estate valued at £10,966.

MR. JAMES PRIOR TODD, Ph.D., Ph.C., chief lecturer in pharmacy and pharmacognosy, has been appointed by the governors of the Royal Technical College, Glasgow, as Professor of Pharmacy as from August 1.

PROFESSOR N. V. SIDGWICK, the retiring president, will preside at the Chemical Society's annual dinner at Grosvenor House on March 18. Following the dinner, the new president, Professor F. G. Donnan, of University College, London, will take the chair.

DR. R. G. W. NORRISH, who has been elected to succeed the late Professor T. M. Lowry in the Chair of Physical Chemistry at the University of Cambridge, is the Humphrey Owen Jones Lecturer in Physical Chemistry at the University. He was formerly a fellow of Emmanuel College.

MR. C. N. HINSHELWOOD, who succeeds Professor Frederick Soddy as the Dr. Lees Professor of Inorganic and Physical Chemistry at the University of Oxford, is a leader of the study of physical chemistry in England and has acquired a reputation by the work he has carried out on gas reactions. He is head of the Balliol and Trinity College laboratories, and is the first member of this school of physical chemistry to become a professor at Oxford.

MR. MATTHEW F. FINDLAY, senior partner of M. F. Findlay and Co., explosives merchants, Glasgow, died on February 17. He became North of Scotland representative of Nobel's Explosives Co., Ltd., over 50 years ago, afterwards representing the firm in the West of Scotland. He was a past-president of the Iron Steel, and Ironmongery Benevolent Institution of Scotland, a Justice of the Peace, a member of Glasgow Merchants' House, and a keen Freemason.

SPEAKING AT A MEETING of the Chemical Society in the Royal Technical College, Glasgow, on February 19, Professor J. P. Kendall, F.R.S., of Edinburgh University, discussed whether the mobility of ions in solution depended on their mass or their volume. It was found, he stated, that the volume factor was significant. Further experiments led to methods whereby elements could be readily separated, in contrast to the tedious methods of recrystallisation, which sometimes had to be adopted.

Chemical Notes from Foreign Sources

Manchukuo

TWO ADDITIONAL PLANTS FOR SOYA BEAN OIL EXTRACTION are to be installed by the Manchurian Soya Bean Industry Co. The alcohol extraction process is used, the overhead costs of which are claimed to be lower than those of rival processes.

Norway

THE GREAKER CELLULOSE CO. declared a dividend of 5 per cent. for 1936. Net profits amounted to 239,327 Kroner (over £12,000) and the production figures for the year constitute a record.

Holland

A WOOL-LIKE MATERIAL SIMILAR TO THE ITALIAN LANITAL has now been developed by the research department of the Aku concern. It is proposed to commence the manufacture at a factory to be built in Nijverdaal.

Czechoslovakia

THE AUSSIG CHEMICAL UNION began the commercial production of oxalic acid last week. The Union is a party to the international oxalic acid agreement, and intends to produce for export besides supplying the home demand.

Italy

A FACTORY FOR THE PRODUCTION OF CELLULOSE AND PAPER from straw was recently started up at Foggia with a daily capacity of 10 tons, which is to be doubled in the near future.

Japan

VINYL ACETATE IS NOW MADE IN JAPAN by the Nippon Chisso Hiryo K.K., of Mizumata.

THE MITSUBISHA CO., through one of the subsidiaries, the Japan Chemical Synthesis Co., is to manufacture artificial indigo.

ALANTOLACTONE, A NEW ANTHELMINTIC, obtained from the elecampane plant (*Inula Helenium*), is claimed to be four times as effective as santonin.

Roumania

LARGE BAUXITE DEPOSITS, owned by the Franco-Swiss "Colomines" Co., of Geneva, are to be intensively developed. A smelting plant with an annual production capacity of 360 truck loads is to be erected and the aluminium production will more than cover the home demand.

Hungary

THE INSTITUTE OF INDUSTRIAL RESEARCH has appointed a special committee to co-ordinate the work of the Institute and relate it to the practical problems of industry. To enable the committee to achieve its task technical exports of various industries will be among its members, and the Association of Hungarian Chemical Manufacturers will be represented.

From Week to Week

OIL FINDING in England and elsewhere was the subject of the Abbott Memorial Lecture given at University College, Nottingham, by Mr. S. G. Clift, on February 19.

THE NOMINAL CAPITAL of the Diamond Fertiliser and Chemical Co., Ltd., Corn Exchange Chambers, Seething Lane, E.C., has been increased by the addition of £5,000 beyond the registered capital of £5,000. The additional capital is divided into 1,000 preference and 500 ordinary shares of £1 and 70,000 deferred shares of 1s.

THE LECTURE ON "OUR MONEY" which Dr. W. H. Coates gave before a joint meeting of the Manchester Sections of the Institute of Chemistry, the Society of Chemical Industry, the Society of Dyers and Colourists, and the Manchester Literary and Philosophical Society, on November 19, 1936, has been published in booklet form by the Institute of Chemistry.

THE BRITISH DRUG HOUSES, LTD., have found it necessary to publish a second edition of their monograph, "The Colorimetric Determination of Oxidation-Reduction Balance." The second edition, which has been carefully revised, provides a theoretical exposition of the subject, an explanation of the use of indicators in measuring oxidation-reduction potentials and references to the employment of oxidation-reduction determinations in biochemical work, milk testing (such as the Ministry of Health's methylene blue test), sewage control, organic chemical analysis, vitamin determinations, etc.

THE GROWTH OF THE DYESTUFF INDUSTRY from the discovery of analine dye by Sir William Perkins over 60 years ago, was reviewed by Mr. C. J. T. Cronshaw, managing director of the Dyestuff Group of Imperial Chemical Industries, Ltd., in an address to the Dundee Business Club on February 16. Mr. Cronshaw said the decline in the British industry was due to the lack of foresight of pioneers of the industry in this country. These men had all retired early in life and control and initiative in the trade had passed to Germany, a fact which was not fully realised till 1914. The British industry had to be rebuilt from the very beginning. Enthusiasts like Sir James Morton had given great help and to-day we were able to compete successfully with Germany.

THE PRESENT YEAR HAS OPENED FAVOURABLY for the china clay industry and the shipments for January show that the demand is increasing each year. With the Spanish market completely inactive, and other restrictive countries, it is gratifying that the china clay trade is gradually recovering its former prosperity. The shipments made in January are as follows:—Fowey, 44,524 tons china clay, 1,655 tons china stone, 1,578 tons ball clay; Par, 10,404 tons china clay, 112 tons china stone; Charlestown, 3,700 tons china clay; Padstow, 1,433 tons china clay; Newham, 172 tons china clay; Plymouth, 27 tons china clay; by rail, 5,635 tons china clay; making a total of 65,895 tons of china clay, 1,767 tons of china stone, and 1,575 tons of ball clay, compared with 59,058 tons of china clay, 4,053 tons of china stone, and 1,668 tons of ball clay in January, 1936.

THE FRENCH TINPLATE AND CANNING INDUSTRIES are described in "Le Fer-Blanc et les Conserves en France," issued as Bulletin 5 of the International Tin Research and Development Council. This book was prepared in collaboration with l'Office Technique pour l'Utilisation de l'Acier, who were also instrumental in obtaining the numerous photographs which occupy 48 pages. The text deals with canned foods from the point of view of wholesomeness, and is intended primarily for dietitians and doctors. Amongst the subjects dealt with are the general methods of preserving foods, the nutritive value of canned foods, and in particular of condensed milks, the food regulations of France as they apply to canned foods, and a brief account of tinplate manufacture.

A SIX-STOREY ADDITION is to be made to the factory recently built by Michael Nairn and Co., Ltd., at Kirkcaldy. The new factory is to be used mainly in connection with the mixing of oils used in linoleum making.

PETROLEUM HAS BEEN FOUND at Salsomaggiore, near Parma, which is a health resort with mineral springs. While digging was in progress to discover a new spring, oil gushed out at the rate of about 1,000 gallons a day, states the "Popolo di Roma."

THE D'ARCY EXPLORATION CO.'s search for oil on the slopes of Portsdown Hill, near Portsmouth, which has been proceeding for nearly twelve months, has been abandoned. When a depth of 6,556 ft. was reached, non-porous rock was encountered. Some trace of oil was discovered, but not in sufficient quantities to justify the continuation of the boring. The drilling machinery is to be transferred to Kingsclere, near Newbury, where further experiments will be carried out.

HOLDERS OF SHARE WARRANTS to bearer for preferred (sterling) shares of the Lautaro Nitrate Co., Ltd., are requested to lodge them at the registered office of the company, to be exchanged for new certificates under the scheme of arrangement sanctioned by the Court on November 30, 1936. Under the scheme the nominal amount of each of the 1,600,000 preferred (sterling) shares has been reduced from £5 to 10s., and such reduced shares have been consolidated into 800,000 fully paid shares of £1 each, called "A" ordinary shares.

SOUTH WALES IS HOPING that the Government's new plans to aid the Special Areas will include the erection of a chain of small low temperature and hydrogenation plants throughout the coalfield. For the past year a special committee of experts, under the auspices of the National Industrial Development Council of Wales and Monmouthshire, has been investigating the oil-extraction processes best suited to Welsh coals. The Special Areas Commissioner gave a grant of £2,500 towards this work. The committee has made an interim report, which is being sent to the Commissioner this week.

ICE IN CRYSTAL FORM will shortly be introduced into this country. The customary method of manufacturing ice is in the form of lumps, which subsequently have to be crushed, and this procedure has been found to be wasteful and costly. By means of a machine designed in America, ice is now being produced in the form of crystals. These crystals can either be employed direct for the protection of perishable foodstuffs or can be made into briquettes by a pressure of 2,500 lb. per square inch. These briquettes have a shape which allows free passage of air, and they give low temperature more quickly than ice in any other form. Crystal ice forms a better protective covering than crushed ice and lasts much longer.

MR. GEORGE W. HUTCHESON, assistant official receiver, in the matter of the compulsory liquidation of Electro Chemical Processes, Ltd., reports that in 1929 the company acquired from Mr. Einstein processes, inventions and letters patent principally relating to electro-plating on non-metallic articles for £210,000. Einstein states that he paid £20,000 of the purchase money to the promoters, a fact which was not disclosed to the board at the time. Preliminary expenses amounted to £42,255. Subsequently the company acquired from Mr. Pigache the world's rights (except United States, Mexico and Latin America) in his patents and discoveries in connection with the production of colloids for £120,000, and in 1930 the rights to the "Eldona" process for plating glass and china at a cost of £3,000. The failure of the company was due to the fact that the processes acquired from Einstein were technically unsound and valueless. Mr. A. E. Dunnill has been appointed liquidator with a committee of inspection.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

TREATMENT OF HYDROCARBON OILS.—Universal Oil Products Co. Aug. 9, 1935. 15279/36.

CELLULOSE DERIVATIVE EMULSIONS.—E. I. du Pont de Nemours and Co. Aug. 15, 1935. 19242/36.

PURIFYING GASES, and apparatus therefor.—Research Corporation. Aug. 14, 1935. 20051/36.

PROCESS FOR THE DECOMPOSITION OF CELLULOSE MATERIALS by means of hydrofluoric acid to form water-soluble products.—H. Bohunek, H. Hoch, and G. Mayrhofer. Aug. 13, 1935. 20654/36.

METHOD OF STABILISING GREEN FODDER.—Naamlooze Vennootschap Internationale Suiker en Alcohol Compagnie International Sugar and Alcohol Co. Isaco. Aug. 12, 1935. 21426/36.

WATERPROOFING COMPOSITION AND METHOD OF MANUFACTURE.—Drigard Products Corporation. Aug. 14, 1935. 21613/36.

MANUFACTURE OF CALCIUM CARBIDE.—A.-G. Fur Stickstoff-Dunger. Aug. 9, 1935. 21985/36.

TREATMENT OR WORKING UP OF NATURAL AND ARTIFICIAL CAOUTCHOUC.—Deutsche Hydrierwerke, A.-G. Aug. 10, 1935. 22003/36.

PRODUCTION OF ARTIFICIAL RESINS.—Allgemeine Elektricitats-Ges. Aug. 10, 1935. 22020/36.

MANUFACTURE OF COMPOUNDS OF THE PHENANTHRENE SERIES.—I. G. Farbenindustrie. Aug. 10, 1935. 22033/36.

PRINTING OF TEXTILE MATERIALS.—E. I. du Pont dé Nemours and Co. Aug. 10, 1935. 22049/36.

PROCESS FOR REFINING MINERAL OILS.—R. Meyer. Aug. 12, 1935. 22199/36.

PROCESS FOR OBTAINING EXTRACTS OF VEGETABLE SUBSTANCES in concentrated form.—G. Madaus, F. Madaus, and H. Madaus (trading as Dr. Madaus and Co.). Aug. 14, 1935. 22359/36.

MANUFACTURE OF AROMATIC SULPHONES and of tanning agents.—J. R. Geigy, A.-G. Aug. 14, 1935. 22422/36.

PROCESS FOR THE MANUFACTURE OF RUBBER THREADS.—W. Diederich. Aug. 14, 1935. 22466/36.

MANUFACTURE OF RUBBER ARTICLES.—E. I. du Pont de Nemours and Co. Aug. 15, 1935. 22650/36.

PROCESS FOR COLOURING ARTIFICIAL MASSES OF CELLULOSE ESTERS and cellulose ethers and lacquers containing them.—J. R. Geigy, A.-G. Aug. 1, 1935. 3836/37.

Specifications Accepted with Date of Application

CLEANSING PREPARATIONS.—J. Halden and Co., Ltd., and J. Holden. May 1, 1935. 460,839.

ELECTRODEPOSITION OF TUNGSTEN and tungsten alloys.—H. H. Armstrong, and A. B. Menefee. April 2, 1935. 460,886.

ELECTRODEPOSITION OF TUNGSTEN and tungsten alloys.—H. H. Armstrong, and A. B. Menefee. Sept. 18, 1934. 460,840.

POLYMERISATION OF GASEOUS OLEFINES.—Anglo-Iranian Oil Co., Ltd., and A. E. Dunstan. June 26, 1935. 460,659.

MANUFACTURE AND PRODUCTION OF ALKYLENE IMINES.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie.) July 15, 1935. 460,888.

MANUFACTURE OF CYANIC OR THIOCYANIC ANHYDRIDES and condensation products thereof.—Soc. Anon des Matieres Colorantes et Produits Chimiques de St.-Denis, and J. Claudin. Aug. 1, 1934. 460,889.

MANUFACTURE AND PRODUCTION OF TANNING AGENTS.—Coutts and Co., and F. Johnson (I. G. Farbenindustrie.) July 30, 1935. (Addition to 411,390.) 460,772.

BITUMINOUS COMPOSITIONS incorporating indiarubber.—T. W. Ward, Ltd., and A. P. Booth. Aug. 1, 1935. 460,854.

MANUFACTURE AND PRODUCTION OF NITROGENOUS CONDENSATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie.) Aug. 2, 1935. 460,710.

TREATMENT OF CYANIDE SOLUTIONS containing dissolved precious metals.—Merrill Co., L. D. Mills, and T. B. Crowe. Aug. 3, 1935. 460,969.

REFINING OF MINERAL-OIL STOCKS.—M. B. Miller and Co., Inc., June 25, 1935. 460,902.

SEPARATION OF HYDROCARBON MIXTURES.—Naamlooze Vennootschap Machinerieen-en Apparaten Fabrieken Meaf. Aug. 7, 1934. 460,906.

PROCESSES FOR WORKING-UP ACID SLUDGE and similar materials, and apparatus therefor.—C. E. Every-Clayton (Pape and Co., Ges.). Aug. 6, 1935. 460,973.

MANUFACTURE AND PRODUCTION OF CHLORINATED CARBOXYLIC ACID.—G. W. Johnson (I. G. Farbenindustrie.) Aug. 7, 1935. 460,720.

PROCESS FOR THE MANUFACTURE OF POLYMERISED CARBOXYLIC ACIDS and derivatives thereof.—A. Carpmael (I. G. Farbenindustrie.) Aug. 7, 1935. 460,914.

PROCESS OF MANUFACTURING CRYSTALLINE SUBSTANCES.—Naamlooze Vennootschap Chemische Fabriek Gembo. Aug. 8, 1934. 460,857.

MANUFACTURE OF 3:4:5:6-HALOGEN-2-AMINO-1-OXYBENZINES.—I. G. Farbenindustrie. Nov. 24, 1934. 460,911.

PRODUCTION OF DISPERSIONS of halogenobutadienes.—E. I. du Pont de Nemours and Co. Aug. 8, 1934. 460,916.

MANUFACTURE OF SULPHURIC ACID DERIVATIVES of imidazolines. Dr. E. Waldmann, and Dr. A. Chwala. Aug. 10, 1934. 460,858.

MANUFACTURE OF AZO DYESTUFFS INSOLUBLE IN WATER.—A. Carpmael (I. G. Farbenindustrie.) Aug. 19, 1935. 460,782.

MANUFACTURE OF DYESTUFFS.—A. G. Bloxam (Soc. of Chemical Industry in Basle). Aug. 20, 1935. 460,725.

MANUFACTURE AND PRODUCTION OF DIACETYL.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie.) Oct. 4, 1935. 460,862.

GASIFICATION OF MINERAL OILS.—C. Padovani. Nov. 8, 1934. 460,801.

ELECTRODEPOSITION OF TUNGSTEN ALLOYS.—H. H. Armstrong, and A. B. Menefee. Sept. 18, 1934. 460,931.

PROCESS OF MANUFACTURING MOTOR FUELS of high anti-knock value.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 24, 1935. 460,746.

PROCESS FOR EFFECTING HYDROGENATION and dehydrogenation of organic compounds.—Naamlooze Vennotschap de Bataafsche Petroleum Maatschappij. April 29, 1935. 460,747.

PRODUCTION OF OLEFINES by catalytic dehydrogenation of paraffin hydrocarbons.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. July 15, 1935. 460,758.

PROCESS FOR IMPROVING THE FASTNESS OF DYEINGS.—A. Carpmael (I. G. Farbenindustrie.) July 5, 1935. 460,961.

Applications for Patents

PREPARATION OF ORTHO-HYDROXYCARBOXYLATES and orthohydroxycarboxylic acids.—E. H. Reichenberg and S. W. Reichenberg. July 26, 1935. 460,282.

DEODORANT BLOCKS for disinfecting water-closets, basins, and the like, and for other purposes.—South Bank Chemical Co., Ltd., and A. J. Caddick. July 27, 1935. 460,041.

PROCESS AND APPARATUS FOR WASHING, desulphurising, bleaching, and dyeing artificial yarns.—W. W. Triggs (Chatillon Soc. Anon. Italiana Per le Fibre Tessili Artificiali). May 6, 1936. 460,079.

SOUP CONCENTRATE and method of manufacture.—A. Verhaeghe. June 1, 1935. 460,116.

APPARATUS FOR THE DETERMINATION AND/OR REGULATION OF THE FAT CONTENT IN MILK.—Bergedorfer Eisenwerk, A.-G.,Astra-Werke. July 5, 1935. 460,006.

APPARATUS FOR THE CATALYTIC TREATMENT, more particularly the purification of gases.—Ruhrchemie, A.-G. October 9, 1935. 460,017.

PRODUCTION OF GLYCOLS.—C. Barbieri. 2741.

PREPARATION OF MAGNESIUM.—Calloy, Ltd., and G. N. Kirsebom. 2510.

MANUFACTURE OF 4-BENZLYAMINO-BENZENE SULPHONIC ACID AMIDE. A. Carpmael (I. G. Farbenindustrie). 3242.

MANUFACTURE OF RAYON YARN.—Cellulose Acetate Silk Co., Ltd., and C. C. Tyrer. 3058.

TREATING DYED MATERIALS.—E. C. Chapin and W. C. Durfee. 2966, 2967, 2968.

GAS-PURIFYING MATERIAL.—Compagnie des Produits Chimiques et Charbons Actifs E. Urbain. (Germany, Jan. 30, '36.) 2957.

GAS-PURIFYING MATERIAL.—Compagnie des Produits Chimiques et Charbons Actifs E. Urbain. (Germany, Aug. 29, '36.) 2958.

CHEMICAL REVERSAL OF PHOTOGRAPHIC PROOFS.—Compagnie Française pour l'Exploitation des Procédés Thomson-Houston. (France, Feb. 20, '36.) 2784.

PREPARATIONS FOR TREATING FOOT-ROT.—Consolidated Rubber Manufacturers, Ltd., F. N. Pickett and R. B. Croad. 2691.

INSECTICIDAL SUBSTANCES.—Consolidated Rubber Manufacturers, Ltd., and R. B. Croad. 2692.

PRESERVING MATERIALS FROM LIVING ORGANISMS.—Consolidated Rubber Manufacturers, Ltd., F. N. Pickett and R. B. Croad. 2693.

MANUFACTURE OF ARTIFICIAL FILAMENTS, ETC.—Courtaulds, Ltd., and J. H. Givens. 3079.

MANUFACTURE OF CELLULOSE DERIVATIVES.—A. C. Cox and J. E. Jones. 3090, 3091.

PRODUCTION OF METAL HALIDES.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. (Germany, Feb. 13, '36.) 2738.

CERAMIC COLOURING MATTERS.—Deutcshe Gold- und Silber-Scheideanstalt vorm. Roessler. 3104, 3105.

MANUFACTURE OF ORGANIC SUBSTANCES.—H. Dreyfus. 3201.

TREATMENT OF LIQUID CARBONACEOUS MATERIALS.—H. Dreyfus. 3202.

TREATMENT OF LIQUID HYDROCARBON PRODUCTS.—H. Dreyfus. 3204.

TREATMENT OF CARBONACEOUS SOLIDS.—H. Dreyfus. 3203.
MANUFACTURE OF CELLULOSE DERIVATIVES.—H. Dreyfus. 3205.
PRODUCTION OF CELLULOSE DERIVATIVES.—E. I. du Pont de Nemours and Co. (United States, Jan. 31, '36.) 2974.
AMINO-DERIVATIVES OF CELLULOSE.—E. I. du Pont de Nemours and Co. (United States, Jan. 31, '36.) 2975.
BLEACHING TEXTILE MATERIALS.—E. I. du Pont de Nemours and Co. 3107.
WETTING, ETC., AGENTS.—J. R. Geigy A.-G. (Germany, Feb. 3, '36.) 3048.
COLOURING OF ARTICLES COMPRISING VINYLPOLYMERIDES CONTAINING HALOGEN.—W. W. Groves (Deutschen Celluloid-Fabrik). 3187.
DISTILLING VINYL-METHYL-KETONE.—W. W. Groves (I. G. Farbenindustrie). 2659.
APPARATUS FOR CONDUCTING DIALYTIC OPERATIONS.—W. W. Groves. 2801.
PREPARATION OF TERPENE ETHERS.—Hercules Powder Co. (United States, Feb. 15, '36.) 2885.
MANUFACTURE OF HIGHER HALOGENATED KETONES.—I. G. Farbenindustrie. (Germany, Jan. 28, '36.) 2504.
CHLORINATING METHANE, ETC.—I. G. Farbenindustrie. (Germany, Jan. 28, '36.) 2505.
MANUFACTURE OF HIGHER CHLORINATED METHANES.—I. G. Farbenindustrie. (Germany, Jan. 29, '36.) 2506.
MANUFACTURE OF ORTHO-OXYAZO-DYESTUFFS.—I. G. Farbenindustrie. (Germany, June 3, '36.) 2661.
MANUFACTURE OF DISAZO-DYESTUFFS.—I. G. Farbenindustrie (Germany, March 31, '36.) 2662.
MANUFACTURE OF BORON CARBIDES.—I. G. Farbenindustrie. (Germany, Jan. 30, '36.) 2664.
COLOURATION OF ALUMINIUM POWDER.—Imperial Chemical Industries, Ltd., J. A. Radley and F. Hill. 2739.
DYEING HARDENED CASEIN.—Imperial Chemical Industries, Ltd., J. A. Radley and F. Hill. 2740.
ANTHRAQUINONE DYESTUFFS.—Imperial Chemical Industries, Ltd., S. Coffey, N. H. Haddock and C. Wood. 2977.
MANUFACTURE OF PROPYL METHACRYLATE.—Imperial Chemical Industries, Ltd., and R. Hill. 3215.
PRODUCTION OF HYDROCARBON GASES.—Institution of Gas Engineers and F. S. Dent. 3047.
PRODUCTION OF CRYSTALLINE DEXTROSE.—International Patents Development Co. (United States, Dec. 14, '36.) 2836.
MANUFACTURING INORGANIC FLUORESCENT GLASS.—Jerome et Bonnefay et Cie. (France, Jan. 30, '36.) 2645.
MANUFACTURE OF VALUABLE HYDROCARBONS FROM MINERAL COALS. G. W. Johnson (I. G. Farrbenindustrie). 2920.
MANUFACTURE OF WATER-SOLUBLE CONDENSATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie). 2921.
MANUFACTURE OF WATER-SOLUBLE BASIC ALUMINIUM COMPOUNDS.—G. W. Johnson (I. G. Farbenindustrie). 3192.
AQUEOUS EMULSIONS OF NITROCELLULOSE, ETC.—A. King. 2724.
HYDROLYSED CELLULOSE ACETATE.—Kodak, Ltd. (United States Feb. 4, '36.) 3170.
BLEACHING TEXTILE MATERIALS.—A. A. Levine. 3107.
REFINEMENT OF MAGNESIUM, ETC.—A. Luschenowsky and P. Briske. 3247, 3248.
MANUFACTURE OF MONOCARBOXYLIC ACIDS.—E. J. Lush. 2713.
CONVERSION OF NORMALLY GASEOUS HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). 2562.
UTILISATION OF GASES FROM CARBON-DISULPHIDE WORKS.—Montecaténi Soc. Generale per l'Industria Mineraria ed Agricola. (Italy, Feb. 1, '36.) 2945.
TREATMENT OF SODIUM SULPHATE.—Montecaténi Soc. Generale per l'Industria Mineraria ed Agricola. (Italy, Feb. 1, '36.) 2946.
PRODUCTION OF LEAD ARSENATE.—Montecaténi Soc. Generale per l'Industria Mineraria ed Agricola. 2947, 2948.
MANUFACTURE OF MONOCARBOXYLIC ACIDS.—E. Neumann. 2713.
TREATMENT OF TEXTILE MATERIALS.—J. Schlumpf. (Italy, June 4, '36.) 2723.
CERAMIC MASSES.—K. Schusterius. 2979, 2980.
MANUFACTURE OF PLASTIC MASSES, etc., composed of aqueous dispersions of lenoxyne.—Soc. Italiana Pirelli. (Italy, Jan. 31, '36). 2954.
PURIFICATION OF CELLULOSE DERIVATIVES.—W. J. Tennant (Henkel and Cie). 2707.
TREATMENT OF CARBONACEOUS MATERIALS.—F. Uhde. (Germany, Feb. 1, '36.) 2932.
MANUFACTURE OF OXIDISED INORGANIC SUBSTANCES.—J. Aitken. 4748.
APPARATUS FOR SEPARATING MAGNESIUM and like metals which sublime from their ores, etc.—H. A. Blackwell, and W. L. Turner. Nov. 27, '36. 4691.
MEASUREMENT OF CHARACTERISTICS OF FERMENTING SUBSTANCES.—C. W. Brabender. (France, Feb. 18, '36.) 4353.
REFRACTORY LININGS FOR SHAFT FURNACES.—H. A. Brassert and Co., Ltd. 4471.
ALLOYS OF ALKALINE EARTH METALS with aluminium.—Calloy, Ltd., and G. N. Kirserom. 4096.
APPARATUS FOR DECONTAMINATING POISIONOUS AIR, ETC.—A. E. Carey, and E. T. Wallis. 4398.
MANUFACTURE OF DYESTUFFS of the anthraquinone series.—A. Carpmael (I. G. Farbenindustrie.) 4241.
MANUFACTURE OF AZO DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) 4483.
MANUFACTURE OF ADHESIVE SUBSTANCES and process of joining by adhesion.—A. Carpmael (I. G. Farbenindustrie.) 4484.
HYDROGENATION OF CARBONACEOUS MATERIALS.—Seskoslovenské Továrny na Dusíkaté Latky Akciova Spolecnost, and V. Viktora. 4294.
MANUFACTURE OF PHARMACEUTICAL PRODUCTS.—Chemische Forschungsges. (Germany, Feb. 14, '36.) 4360.
EQUIPMENT FOR DEHYDRATING, ETC. HYDRATED MATERIALS.—F. B. Dehn (American Potash and Chemical Corporation.) May 8, '36. 4106.
MANUFACTURE OF ARYL SUBSTITUTED MONO OLEFINES.—Distillers Co., Ltd., J. E. Youell, H. M. Stanley, and G. Minkoff. 4263.
MANUFACTURE OF ETHYLENE OXIDE.—Distillers Co., Ltd., and H. M. Stanley. 4774.
ASPIRATOR-EJECTOR FOR PHYSICAL, ETC. TREATMENT OF INDUSTRIAL GASES, ETC.—F. Garnier. (France, Feb. 12, '36.) 4077.
IMPARTING HYDROPHOBIC PROPERTIES TO CELLULOSE FIBRES.—W. W. Groves (I. G. Farbenindustrie.) June 21, '35. 4212.
MANUFACTURE OF QUATERNARY AMMONIUM COMPOUNDS.—W. W. Groves (I. G. Farbenindustrie). 4213.
WATERPROOFING TEXTILE MATERIALS.—W. W. Groves (I. G. Farbenindustrie.) March 27, '36. 4642.
DECOMPOSITION OF VEGETABLE AND ANIMAL FATS INTO FATTY ACIDS. E. Hoffmann. (Germany, Feb. 18, '36.) 4425.
GAS-MASKS.—A. I. Ingold, and D. F. Ingold. 4740.

Chemical and Allied Stocks and Shares

BEARING in mind the general market trend it is hardly surprising the undertone in shares of chemical and kindred companies has been reactionary. Distillers were particularly weak, there having been a fall on the week from 114s. 6d. to 104s. 3d. This is a reflection of the fear that the company might have to face special taxation, but it is due mainly to the view now current in the market that the directors may not decide to distribute the long-hoped-for share bonus this year. Turner and Newall were relatively steady and are 103s., compared with 105s 3d. a week ago. Associated Portland Cement at 100s. 7½d. were firmer awaiting the dividend announcement, but as compared with a week ago have lost 4s. British Oxygen were lower but showed activity, there being continued talk of a possible issue of shares to shareholders on favourable or bonus terms later in the year. Pinchin Johnson were lowered sharply in view of the general market trend, but as in the case of the forthcoming results of other paint companies, it is generally expected by market men that good figures will again be shown.

Boots Pure Drug are 54s. 3d., compared with 56s. 9d. a week ago, although hopes of a possible bonus still persist and it is generally agreed that the results for the year ending next month, due in June, are likely to show a further excellent increase in profits. Timothy Whites and Taylors and Sangers were relatively well maintained; Monsanto Chemicals preference shares and Greeff Chemicals Holdings ordinary shares were also fairly steady on the continued belief that results of both companies will be favourable. Canning Town Glass and United Glass Bottle were firm on hopes that the impending results will announce larger dividends. United Premier Oil and Cake ordinary and British Oil and Cake Mills preferred shares were little changed on balance, sentiment being assisted by anticipations that both companies are probably earning larger profits. Triplex Safety Glass failed to respond in price but were again active. Salt Union have reacted from 47s. to 45s. 6d., market hopes of a larger dividend having been again disappointed. Imperial Chemical are 38s. 6d., compared with 40s. 3d. a week ago, the view having grown that the directors will probably continue to limit the dividend to 8 per cent.

Dorman Long, Consett Iron, Guest Keen, United Steel, and shares of other iron, steel and allied companies which are likely to benefit from the rearmament programme have been active and made higher prices in most cases. Textile shares were reactionary, despite the results of Bradford Dyers and Courtaulds, which were in excess of general market expectations. Oil shares came in for profit-taking after their recent large advance. Unilever, Swedish Match and most other internationally-dealt-in shares were active and fairly well maintained in price. International Nickel were bought on the belief that in view of the rise in the price of the metal the company's profits are probably also benefiting considerably from its copper production; a further increase in the next quarterly dividend is generally expected.

Weekly Prices of British Chemical Products

THE price of refined glycerine has been advanced by a further £10 per ton during the week. There are no price changes to report in the London markets for general chemicals, rubber chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. In the coal tar products sections there have been increases in carbolic acid, medium soft pitch and in all grades of cresylic acid and benzol.

GLASGOW.—The Scottish heavy chemical market has not yet resumed its normal business position, having kept extremely quiet since the beginning of the year. There has been a better demand for chemicals for home trade during the week, though export business still remains very limited. Prices generally continue firm at about previous figures, and lead, copper and zinc products are all dearer on account of the advances in metal prices. Conditions in the coal tar products market continue very steady with prices firm in every department with the exception of pitch. More interest has been shown in the latter product also, but only a few fresh transactions have actually been concluded. On account of the continued scarcity of supplies there has been practically no new buying of cresylic acid, and prices therefore remain as last reported. Crude benzol has advanced by ½d. per gal. and large quantities are moving well in this district. Motor benzol and solvent naphthas show less activity particularly in the case of some of the lower gravity qualities.

General Chemicals

ACETONE.—£45 to £47 per ton.

ACID, ACETIC.—Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £30 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, in 1-cwt. bags, £28; powdered, in 1-cwt. bags, £29.

ACID, CHROMIC.—9¼d. per lb., less 2½%; d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 11¾d. SCOTLAND: B.P. crystals, 1s. per lb., less 5%.

ACID, FORMIC.—85%, in carboys, ton lots, £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 5s. to 7s. 6d. carboy d/d according to purity, strength and locality.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50: pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works.

ACID, OXALIC.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.

ACID, SULPHURIC.—168° Tw., £4 5s. to £4 15s. per ton; 140° Tw., arsenic-free, £2 15s. to £3 5s.; 140° Tw., arsenious, £2 10s.

ACID, TARTARIC.—11⅞d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 11¾d. to 1s. per lb.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 2s. 6d. per ton; lump, £9 12s. 6d.

ALUMINIUM SULPHATE.—£7 per ton d/d Lancs.; GLASGOW: £7 to £8 ex store.

AMMONIA ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £16 10s. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—£55 10s. per ton.

ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered £17 ex store. MANCHESTER: White powdered Cornish, £18, ex store.

BARIUM CHLORIDE.—£10 per ton. GLASGOW: £11 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9.

BORAX COMMERCIAL.—Granulated, £14 10s. per ton; crystal £15 10s.; powdered, £16; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £14 10s. per ton in 1-cwt. bags, carriage paid.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums. GLASGOW: 70/75% solid, £5 10s. per ton net ex store.

CHROMETAN.—Crystals, 2⅜d. per lb.; liquor, £19 10s. per ton d/d.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. GLASGOW: £3 19s. net.

FORMALDEHYDE.—£22 10s. per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £5 7s. 6d. to £6 7s. 6d. per cwt. according to quantity; in drums, £5 to £5 13s. 6d.

IODINE.—Resublimed B.P., 5s. 1d. per lb.

LEAD ACETATE.—LONDON: White, £35 10s. per ton; brown, £35. GLASGOW: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36, brown, £35.

LEAD NITRATE.—£39 per ton.

LEAD, RED.—SCOTLAND: £43 per ton less 2½%, carriage paid, for 2-ton lots.

LEAD (WHITE SUGAR OF).—GLASGOW: £36 10s. per ton net, ex store.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PARAFFIN WAX.—SCOTLAND: 3⅜d. per lb.

PHENOL.—6¾d. to 7½d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £40.

POTASSIUM BICHROMATE.—SCOTLAND: 5d. per lb., less 5%, carriage paid.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £38 per ton.

POTASSIUM IODIDE.—B.P. 4s. 3d. per lb.

POTASSIUM NITRATE.—£27 per ton. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 10¾d. to 11½d.

POTASSIUM PRUSSATE.—6½d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6½d. to 6¾d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. GLASGOW: Large crystals, in casks, £38.

SALT CAKE.—Unground, spot, £3 16s. 6d. per ton.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £12 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£18 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £12 10s. per ton in 1 cwt. kegs, £10 15s. per ton in 2 cwt. bags. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. MANCHESTER: 4d. per lb. GLASGOW: 4d., less 5% carriage paid.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£26 10s. to £30 per ton. GLASGOW: £1 10s. per cwt.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHATE.—Commercial, 2 ton lots d/d, £10 5s. per ton; photographic, £14 5s. MANCHESTER: Commercial, £10; photographic, £14 10s.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £7 15s. per ton for 6-ton lots d/d.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—4d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 4½d.

SODIUM SILICATE.—£9 10s. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 5s. per ton d/d in drums; crystals 30/32%, £8 15s. per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

SODIUM SULPHITE.—Pea crystals, spot, £13 5s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHATE OF COPPER.—£20 per ton, less 2%, in casks. MANCHESTER: £20 10s. per ton f.o.b. SCOTLAND: £22 15s. per ton less 5%, Liverpool, in casks.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

ZINC SULPHATE.—Crystals, £9 per ton, f.o.r., in bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb., according to quality. Crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARYTES.—£6 to £7 10s. per ton, according to quality.

CADMIUM SULPHIDE.—5s. 3d. to 5s. 6d. per lb.

CARBON BISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.

CARBON BLACK.—3 11/16d. to 4 13/16d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 1s. 2d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4½d. to 5d. per lb.; dark, 3¾d. to 4¼d. per lb.

LAMP BLACK.—£22 to £23 per ton d/d London; vegetable black, £28 to £48.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE.—30%, £16 10s. to £17 5s. per ton.

SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.

VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.

ZINC SULPHIDE.—10d. to 11d. per lb., according to quality.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Neutral quality, basis 20.6 per cent. nitrogen, delivered in 6-ton lots to farmer's nearest station, February, £7 3s. 6d. per ton; March to June, £7 5s. per ton.

CALCIUM CYANAMIDE.—February, £7 2s. 6d. per ton; March, £7 3s. 9d. per ton; April to June, £7 5s. per ton, carriage paid to any railway station in Great Britain in lots of four tons and over.

NITRO-CHALK.—£7 5s. per ton for delivery to end of June.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery up to end of June.

CONCENTRATED COMPLETE FERTILISERS.—£10 12s. to £11 1s. per ton for delivery up to end of June, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton for delivery up to end of June, delivered in 6-ton lots to farmer's nearest station.

Coal Tar Products

ACID, CRESYLIC.—97/99%, 3s. 11d. to 4s. per gal.; 99/100%, 4s. to 4s. 6d. per gal., according to specification; pale 99%, 4s. 1d. to 4s. 2d.; dark, 3s. 4d. to 3s. 6d. GLASGOW: Pale, 99/100%, 3s. 3d. to 4s. per gal.; pale, 97/99%, 3s. to 3s. 4d., dark, 97/99%, 2s. 9d. to 3s.; high boiling acids, 2s. to 2s. 3d.; American specification, 3s. to 3s. 3d. MANCHESTER: Pale, 99/100%, 3s. 11d.

ACID, CARBOLIC.—Crystals, 6¾d. to 7½d. per lb.; crude, 60's, 2s. 9d. to 1s. 11d. per gal. MANCHESTER: Crystals, 6¾d. to 7s. per lb.; crude, 2s. 9d. per gal. GLASGOW: Crude, 60's, 2s. 9d. to 3s. per gal.; distilled, 60's, 3s. to 3s. 4d.

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. LONDON: Motor, 1s. 3½d. GLASGOW: Crude, 9½d. to 10½d. per gal.; motor, 1s. 2½d. to 1s. 3½d.

CREOSOTE.—B.S.I. Specification standard, 5¾d. to 6d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4¾d. f.o.r. North: 5d. London. MANCHESTER: 5½d. to 6d. GLASGOW: B.S.I. Specification 5½d. to 5¾d. per gal.; washed oil, 4¾d. to 5¼d.; lower sp. gr. oils, 5d. to 5½d.

NAPHTHA.—Solvent, 90/160%, 1s. 6½d. to 1s. 7½d. per gal.; 95/160%, 1s. 7d.; 90/190%, 1s. 1d. to 1s. 2½d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. GLASGOW: Crude, 6d. to 6½d. per gal.; 90% 160, 1s. 4d. to 1s. 5d. 90% 190, 1s. to 1s. 1d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £11 10s. to £12 10s. per ton; purified crystals, £18 to £20 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free).

PYRIDINE.—90/140%, 9s. to 9s. 6d. per gal.; 90/180, 2s. 6d. to 3s. GLASGOW: 90% 140, 9s. to 10s. per gal.; 90% 160, 7s. to 8s.; 90% 180, 2s. 6d.

TOLUOLE.—90%, 2s. per gal.; pure, 2s. 5d. GLASGOW: 90%, 120, 1s. 10d. to 1s. 11d. per gal.

PITCH.—Medium, soft, 35s. per ton, in bulk at makers' works. MANCHESTER: 34s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 28s. 6d. to 35s. per ton; in bulk for home trade, 32s. 6d.

XYLOL.—Commercial, 2s. 1d. per gal.; pure, 2s. 3d. GLASGOW: Commercial, 1s. 11d. to 2s. per gal.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. to £9 per ton; grey, £10 10s. to £11. Liquor, brown, 30° Tw., 6d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11 10s.

CHARCOAL.—£5 5s. to £10 per ton, according to grade and locality.

METHYL ACETONE.—40-50%, £43 to £46 per ton.

WOOD CREOSOTE.—Unrefined 6d. to 9d. per gal., according to boiling range.

WOOD, NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 3d. per gal.; solvent, 3s. 3d. to 3s. 6d. per gal.

WOOD TAR.—£2 to £3 per ton.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex toluol).—1s. 9½d. per lb. d/d buyer's works.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZIDINE, HCl.—2s. 5d. per lb., 100% as base, in casks.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESEL 30/31° C.—6¼d. to 7¼d. per lb. in 1-ton lots.

p-CRESOL 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—7¼d. per lb.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 10d.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works

β-NAPHTHOL.—In bags, £88 15s. per ton; in casks, £89 15s.

α-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0½d. in casks.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works in casks.

o-NITRANILINE.—3s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works

p-NITRANILINE.—Spot, 1s. 8d. to 2s. 1d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb., 100% d/d buyer's works.

o-TOLUIDINE.—10½d. per lb., in 8/10-cwt. drums, drums extra.

p-TOLUIDINE.—1s. 10½d. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Latest Oil Prices

LONDON, Feb. 24.—LINSEED OIL was firmer, Spot, £29 10s. per ton (small quantities); March and April, £27; May-Aug., £27 5s.; Sept.-Dec., £27 7s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), afloat, Rotterdam, £27 15s. per ton. RAPE OIL was slow. Crude extracted, £35 10s. per ton; technical refined, £36 10s., naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £29 10s. per ton; refined common edible, £33; deodorised, £35, naked, ex mill (small lots £1 10s. extra). TURPENTINE was quiet. American, spot, 41s. 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted, £27 5s. per ton; Feb., £26 15s.; March-April, £26 17s. 6d.; May-Aug., £27; Sept.-Dec., £27 5s. COTTON OIL.—Egyptian crude, spot, £29 10s. per ton; edible, refined, spot, £32 10s.; technical, spot, £32 10s.; deodorised, £34 10s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £31 10s. per ton, naked. GROUNDNUT OIL.—Extracted, spot, £31 10s. per ton; deodorised, £34 10s. RAPE OIL.—Extracted spot, £34 10s. per ton; refined, £35 10s. SOYA OIL.—Extracted, spot, £31 10s. per ton; deodorised, £33 10s. COD OIL, f.o.r. or f.a.s., 27s. 6d. per cwt. in barrels. CASTOR OIL.—Pharmaceutical, 45s. per cwt.; first, 40s.; second, 38s. TURPENTINE.—American, spot, 43s. 6d. per cwt.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

GOONVEAN AND ROSTOWRACK CHINA CLAY CO., LTD., St. Austell. (M., 27/2/37.) Feb. 13, £50,000 mortgage to trustees of the will, etc., of Evelyn 6th Viscount Falmouth; charged on lands in parishes of St. Dennis and St. Stephen in Brannel, etc. *Nil. Jan. 15, 1937.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

ECCLES JNO., AND CO. (firm), Albert Street, Mill-Hill, Blackburn, chemical manufacturers and merchants. (C.C., 27/2/37.) £16 6s. 9d. January 21.

MCINTYRE, RCHD., 141 Malverne Road, Billingham, synthetic worker. (C.C., 27/2/37.) £16 5s. 6d. January 26.

SHIELDS, THOS., 68 Greta Road, Norton, synthetic worker. (C.C., 27/2/37.) £13 2s. 6d. January 26.

Companies Winding-up Voluntarily

STERILIZAIR, LTD. (C.W.U.V., 27/2/37.) By extraordinary resolution, February 15, 1937. Thomas G. Weavers, of 5 Budge Row, London, E.C.4, appointed liquidator.

Forthcoming Events

LONDON.

Mar. 1.—Institute of Chemistry. Annual General Meeting. London.

Mar. 1.—Royal Society of Arts. Cantor Lecture, "The Physics and Chemistry of Paintings." F. Ian G. Rawlings. 8 p.m. John Street, Adelphi, London.

Mar. 1.—Society of Chemical Industry (London Section). "Natural and Artificial Radio-elements and their Practical Applications in Chemical and Biological Research." Professor F. Paneth. 8 p.m. Rooms of the Chemical Society, Burlington House, Piccadilly, London.

Mar. 2.—Institute of Fuel, Institution of Automobile Engineers, etc. Symposium on "Research in Relation to the Motor Vehicle." "Some Factors Affecting Design." C. G. Williams. "Fuels and Lubricants." Dr. F. H. Garner. "Materials with Special Reference to Steel." Dr. T. Swinden. 7 p.m. Royal Geographical Society's Rooms, Kensington, London.

Mar. 2.—Institution of the Rubber Industry and Textile Institute (London Sections). "Cotton Processing." Fletcher Chadwick. 7.30 p.m. Institution of Mechanical Engineers, Storey's Gate, London.

Mar. 3.—Electrodepositors' Technical Society. First International Electrodeposition Conference. 12.15 p.m. Opening Ceremony by the Rt. Hon. Lord Melchett. 2.30 p.m. "Electrodeposition Practice Abroad." 7.30 p. m. "Electrodeposition of Base Metals." British Industries House, Marble Arch, London.

Mar. 3.—Institute of Chemistry. Visit to Messrs. Lyons' Laboratories, London.

Mar. 4.—Electrodepositors' Technical Society. First International Electrodeposition Conference. 10 a.m. "The Properties of Electrodeposits." 2.30 p.m. "Electrodeposition of Precious Metals." British Industries House, Marble Arch. 7.30 p.m. Reception, Dinner and Dance. Criterion Restaurant, Piccadilly Circus, London.

Mar. 4.—Chemical Society. "Some Problems of Tyrosine Metabolism." Professor H. S. Raper. 8 p.m. Burlington House, Piccadilly, London.

Mar. 5.—Electrodepositors' Technical Society. Visit to Oxford. Tour of the Colleges. Visit to the Electroplating Plant of Messrs. Morris Motors, Ltd.

Mar. 5.—Society of Public Analysts and Other Analytical Chemists. Annual General Meeting. "The Alkaloids of Ergot." Professor G. Barger. 5.45 p.m. Rooms of the Chemical Society, Burlington House, Piccadilly, London.

Mar. 5.—Royal Institution of Great Britain. "Electron Diffraction and Surface Structure." Professor G. I. Finch. 9 p.m. 21 Albemarle Street, London.

BELFAST.

Mar. 4.—Institute of Chemistry. (Belfast Section). "Measurements of Hydrogen Ion Concentration." G. R. Perdue, and Demonstrations of pH Apparatus. 7.30 p.m. Physics Lecture Theatre, Royal Belfast Academical Institution, Belfast.

BIRMINGHAM.

Mar. 2.—Electrodepositors' Technical Society. (Birmingham Section). "The Art of Metal Cleaning." Colonel A. J. Round. 7.30 p.m. James Watt Memorial Institute, Gt. Charles Street, Birmingham.

Mar. 4.—Institute of Metals. (Birmingham Section). "Corrosion." Ulick R. Evans. 7 p.m. James Watt Memorial Institute, Gt. Charles Street, Birmingham.

BRISTOL.

Mar. 4.—Society of Chemical Industry (Bristol Section and Plastics Group). "Synthetic Resinous Products in the Electrical Industry." R. Newbound. 7.30 p.m. Chemical Department, The University, Woodland Road, Bristol.

GLASGOW.

Mar. 5.—Society of Chemical Industry (Glasgow Section). Annual General Meeting. Chairman's Address, J. W. Napier. 6.45 p.m. Royal Technical College, Glasgow.

LEEDS.

Mar. 6.—International Society of Leather Trades' Chemists (British Section). "Development and Effect of Metallic Soaps in Light Leather Tanning." R. Faraday Innes. "Tannins as Opsonins." F. C. Thompson and Dr. J. Gordon. "The Action of Nitrous Acid on Collagen." W. R. Atkin. 10 a.m. Lecture Theatre of the Electrical Engineering Department, The University, Leeds.

LIVERPOOL.

Mar. 5.—Society of Chemical Industry (Liverpool Section). "Recent Work on the Examination of Documents in Criminology." 6 p.m. The University, Liverpool.

MANCHESTER.

Mar. 1.—Institute of the Plastics Industry. (Manchester Section). Prize Papers. College of Technology, Manchester.

Mar. 3.—Manchester Metallurgical Society. "Corrosion." W. H. Hatfield. 7 p.m. Constitutional Club, St. Ann's Street, Manchester.

Mar. 4.—Institute of Vitreous Enamellers. (Northern Section). "System of Plant Operation to Eliminate Enamelling Defects." J. T. Gray. 7.30 p.m. Queen's Hotel, Manchester.

Mar. 5.—Institution of Petroleum Technologists, Oil and Colour Chemists' Association and Society of Chemical Industry. (Manchester Sections). "Industrial Solvents." F. N. Harrap. 7 p.m. Constitutional Club, St. Ann's Street, Manchester.

NEWCASTLE-UPON-TYNE.

Mar. 4.—Institute of Chemistry. (Newcastle and North East Coast Section). "Recent Developments in Water Treatment." P. Hamer. Sunderland Technical College, Newcastle-upon-Tyne.

Mar. 5.—The Bedson Club. "The X-Ray Interpretation of Protein Structure." Dr. W. T. Astbury. 6.30 p.m. Chemistry Lecture Theatre, Armstrong College, Newcastle-upon-Tyne.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Australia.—The partner of a Sydney firm of wholesale importers and agents is due to arrive in this country about March 11. He is seeking United Kingdom agencies for industrial chemicals, synthetic resins, solvents, dry colours, gums, pigments, waxes, emulsifying agents and other industrial materials, on a purchasing basis, for the States of New South Wales and Victoria. (Ref. No. 760.)

British India.—A firm of manufacturers' representatives, commission agents and dealers in provisions, etc., established at Karachi, wishes to obtain the representation, on a commission or purchasing basis, for Sind, Baluchistan and Punjab, of United Kingdom manufacturers of photographic chemicals. (Ref. No. 765.)

Switzerland.—An agent established at Zurich wishes to obtain the representation on own account or on a commission basis of United Kingdom manufacturers of chemicals for industrial purposes. (Ref. No. 789.)